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No. 6

TOUR OF THE LAKES.

THE HOUSE COMMITTEE ON RIVERS AND HARBORS AND SENATE COMMITTEE ON COMMERCE ARE MAKING A THOROUGH INSPECTION OF ALL LAKE PORTS.

The committee on rivers and harbors of the house of representatives and the committee on commerce of the senate are at present making a tour of the lakes. The party started from Buffalo on Monday and after visiting the ship yards, dry docks, coal docks and elevators, made a special trip to Niagara Falls. During the evening, at Buffalo, a banquet was tendered to the congressmen at the Iroquois hotel. The revenue cutter Fessenden had been placed at the disposal of the committees and Tuesday and Wednesday were spent in an inspection of the ports of Conneaut, Ashtabula and Fairport. On Wednesday evening the visitors reached Cleveland. There are in the party Hon. Theodore E. Burton, chairman of the committee on rivers and harbors; Representative and Mrs. Roswell P. Bishop, Michigan; Representative and Mrs. Ernest T. Acheson, Pennsylvania; Representative and Mrs. George P. Lawrence, Massachusetts; Representative and Mrs. Rufus E. Lester, Georgia; Representative and Mrs. John H. Bankhead, Alabama; Representative E. R. Sherwood, Philadelphia; Representative and Mrs. Philip D. McCulloch, Arkansas; Representative Albert S. Berry and Mrs. and Miss Berry, Kentucky; Representative and Mrs. Stephen M. Sparkman, Florida; Representative and Mrs. James H. Davidson, Wisconsin; Gen. H. H. Bingham, Philadelphia; Representatives E. R. Weeks and Charles D. Sheldon, Michigan; Representative and Mrs. Walter Reeves, Illinois, and Representative and Mrs. Blackburn B. Dovener, West Virginia. The United States senate is represented by Senator Thomas S. Martin of Virginia, who is accompanied by Mrs. Martin. Prof. Willis L. Moore, chief of the United States weather bureau, is also with the party. The Lake Carriers' Association is represented by its counsel, Harvey D. Goulder of Cleveland, and its secretary, Charles H. Keep of Buffalo; W. C. Farrington, Buffalo; J. S. Dunham, Chicago; George W. Gardner, Cleveland, and A. B. Wolvin, Duluth.

A thorough inspection of Cleveland harbor was made, both inner and outer. A tour of the river was made on tugs and the lumber docks, furnace docks, dry docks and ship building plants were visited. During Thursday afternoon a visit was paid to Lorain.

The party will go to Sandusky and Toledo on Friday and will visit Detroit on Saturday. At the latter point one of the Northern Steamship Co.'s passenger steamers will be taken for the Sault and Duluth. From Duluth a two days' trip will be taken to the iron ore mines and the party will disband at Chicago.

Hon. T. E. Burton, discussing the trip, said:

"The lake channels are sure to receive large appropriations at the next session of congress. Their importance is coming to be realized and the marvelous growth of commerce between the different lakes has awakened very general attention. It is a mere repetition of statements often made to say that the tonnage passing through the Sault canals is between twice and three times as much as that passing through the Suez canal. This is true, although the Soo canals are open to navigation on an average less than eight months per year. In the year 1899 the freight carried through amounted to 25,000,000 tons. The tonnage passing through Detroit river is greater than that of any river, strait or waterway in the world. Although the great bulk of this traffic is domestic, no port or waterway has so great an aggregate of tonnage, even when domestic and foreign commerce are combined. The amount of freight tonnage passing through the Detroit river this year will come close to 40,000,000 tons, and may exceed that figure.

"One reason why large appropriations will be necessary for the lakes is the fact that the traffic has been increasing so rapidly that it has been impossible to make adequate provision for the future. When a channel is improved, or a lock is built, it is scarcely finished before additional facilities are required.

"I anticipate that the visit of the rivers and harbors committee to the lake region will impress upon the members the magnitude of this traffic, and the importance of making provision for increased waterways. It would be a mistake to suppose that any of the members of the committee are ignorant of the great extent of the commerce on the lakes. All of them have given painstaking attention to the channels and the harbors of the whole country. They have gained information from the study of reports and by hearing delegations from different localities. This trip, however, is conveying a more vivid impression to all of them.

"Among the proposed improvements to which special attention will be called the following will be prominent:

"1. The Detroit river, from its mouth in Lake Erie up. Here Lieut. Col. Lydecker has filed a report giving three plans, designated as A, B and C. I shall advise the members of the committee to take, in addition to the sail up the river on Friday, Aug. 10, a special trip on Saturday, the 11th, for the express purpose of examining these three plans suggested by Col. Lydecker.

"2. The St. Clair flats canal, with a view to doubling the capacity of the canal. This may be done either by removing the embankment or wall on the west side of the canal and erecting another twice as far distant from the east embankment of the canal, or, better perhaps, by allowing both of the present embankments to stand and building another parallel embankment to the west, thus providing for an up and down channel.

"3. An improvement of the connecting waters between Lake Michigan and Lake Superior, below the locks. The present facilities are altogether inadequate. An official report, made last winter, estimated the loss to navigation by blockades in the year 1899 at about \$350,000. The report stated that this amount was a direct loss easily itemized, and that the actual loss was probably much greater. The wrecking of a boat with a cargo of ore, or the swinging around of a ship in the channel might block

the waterway for weeks and inflict incalculable injury upon the business interests of this country. It would shut off the source from which comes the greater part of the iron ore supply of the country, and a very large share of the grain.

"Two plans have been suggested, as at the St. Clair flats canal. One is to double the width of the present channel. Another, which seems to meet with greater favor among vessel men and masters, is to provide an alternative channel of equal width with the present on the other side of Neebish island and make a regulation that the down boats should go upon one side and the up boats on another. In 1896 I introduced a bill which became a law, giving to the revenue cutter service of the government jurisdiction over the speed, management, etc., of ships in these channels between Lake Superior and Lake Huron, according to regulations to be framed by the treasury department. Under this law such a regulation as that suggested could be framed and but for this control, collisions and blockades would be of frequent occurrence.

"The improvement of the channels between Lakes Superior and Huron have been more strenuously urged than any other.

"While I do not wish to express any opinion as to what ought to be done in this locality in anticipation of the action of the committee next winter, it is well to note that for six miles the waterway is only 300 ft. in width through which boats going up and down, carrying 25,000,000 of freight, as well as a large number of passengers, must pass. Provision has already been made for a channel 2,000 ft. in width, as an outlet from New York harbor to the sea. A survey is in progress for an equal width of channel from Boston harbor to the sea.

"4. The building of new locks, or enlargement of the locks as well as of the canal, at Sault Ste. Marie."

Prof. Willis L. Moore, chief of the weather bureau, says that his mission is to investigate particularly the storm warning service and to improve it wherever possible. The department proposes to replace the old wooden poles with new steel towers 100 ft. high. At its grounds in Indiana the department has 150 of these towers finished and fifty of them will probably be placed along the lakes.

BIDS SOLICITED FOR SIX ARMORED CRUISERS.

The secretary of the navy has issued to ship builders a circular calling for bids for the construction of six armored cruisers—three authorized by the act of March 3, 1899, and three by the act of June 7, 1900. Those authorized by the former act are to be sheathed and coppered. By the terms of the circular two classes of bids are called for regarding the first three, one for sheathing and coppering, and the other without it, department reserving the right to adopt either form of construction. The specifications for the latter three ships call for unsheathed vessels. The bids are to be opened Dec. 7. The plans will be ready for distribution to the bidders Nov. 8. No bids will be considered which propose to furnish vessels of less than 13,400 tons trial displacement for unsheathed vessels and of less than 13,800 tons trial displacement for sheathed, or of less than twenty-two knots speed and a bunker capacity of 2,000 tons. The maximum time allowed for completion is thirty-six months for each vessel with penalties of \$300 per day for each day in excess of that time for the first month and \$600 for each subsequent day. For deficiency of speed not below twenty knots the vessel will be accepted at a reduced compensation of \$50,000 for each quarter knot to twenty-one and a half knots and \$100,000 per quarter knot down to twenty knots. The vessels will have twin screws, and will be fitted throughout with the most modern machinery. The main batteries will consist of four 8-inch breach-loading rifles, 245 calibers length and fourteen 6-inch breach-loading rapid-fire rifles of 50 calibers length. The secondary batteries will consist of eighteen 3-inch B. L. rifles, twelve 3-pounder guns, four 1-pounder automatic guns, four 1-pounder single shot guns, two 3-inch field guns, two machine guns, six automatic guns and two submerged torpedo tubes. The limit of cost of each of the three ships authorized by the act of 1899 is \$4,000,000, and each of those authorized by this year's naval bill, \$4,250,000.

There is destined to be a radical difference of opinion among members of the naval board on construction in regard to the designs for the three projected cruisers authorized by the last congress. The question of plans and specifications is now before the board and already there are evidences that there will be a clash of technical views. The design which seems to be favored at present by a majority of the board contemplates a vessel with a trial displacement of 9,500 tons or a displacement of more than 10,000 tons when the vessel is finished. The chief constructor of the navy does not approve of this design. He believes that the letter of the law should be more closely adhered to and that the cruisers to be built should not be more than 8,000 tons trial displacement. He has pointed out that a difference in size and the addition of armor will place the three ships in the armored cruiser class which was not contemplated or approved by congress.

Rear Admiral A. S. Crowninshield, chief of the bureau of navigation, has taken measures for bringing the enlisted strength of the navy up to the limit prescribed by law. There are today 3,700 vacancies in this branch of the navy. Believing that the south has many young men who desire to earn their living upon American men-of-war Admiral Crowninshield has directed that a naval recruiting rendezvous be established in the south. The rendezvous will be under the control of Lieutenant Commander J. B. Collins, and it will be first established in Pensacola. From that point it will move to different points between Jacksonville and New Orleans.

The bureau of navigation treasury department reports that 105 vessels of 35,944 gross tons were built in the United States and officially numbered during the month of July.

A NEW STEEL MILL.

ONE WILL BE BUILT IN CONNECTION WITH THE PLANT OF THE NEWPORT NEWS COMPANY—A TALK WITH COLLIS P. HUNTINGTON.

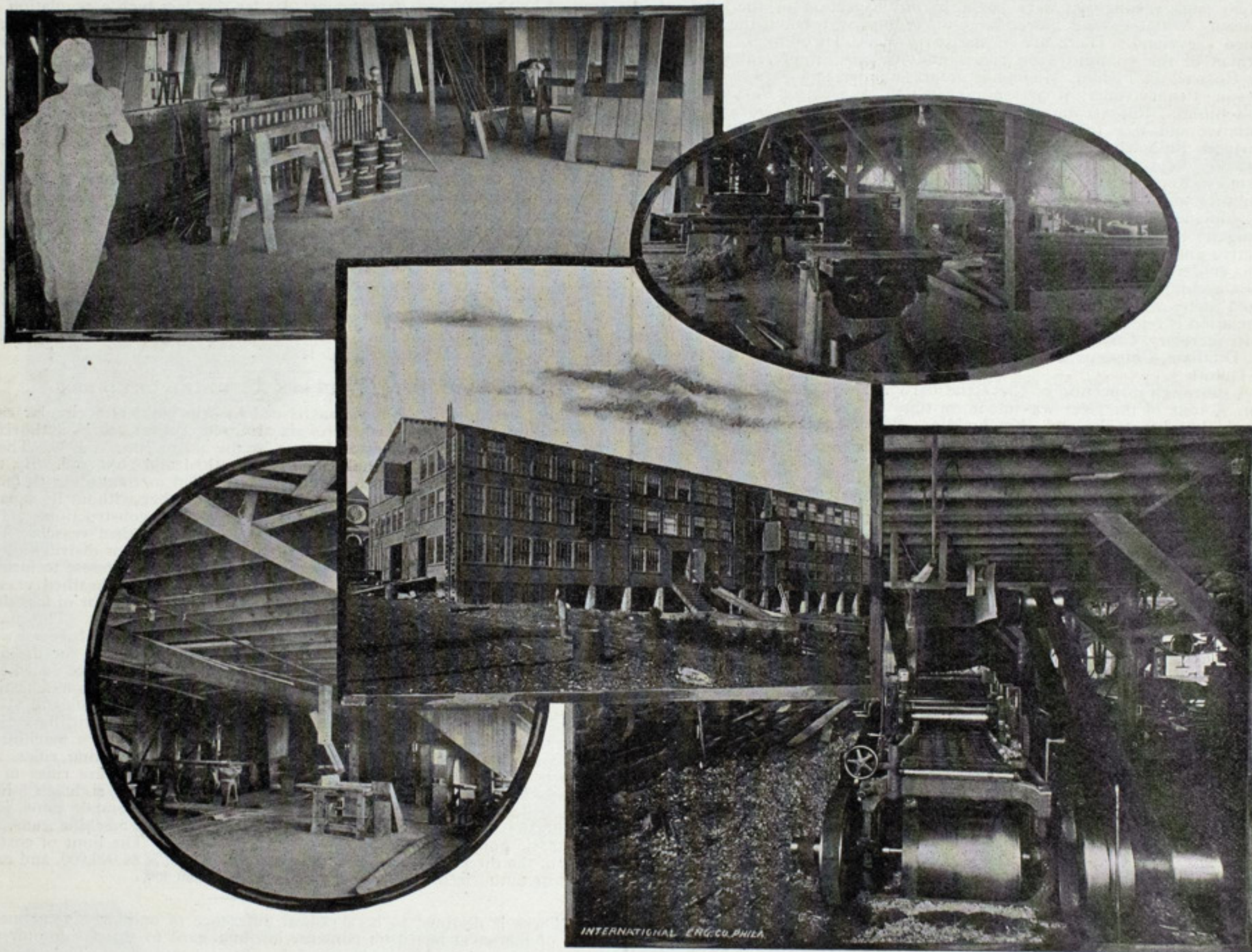
Mr. Collis P. Huntington has spent the greater part of the past week at Newport News and has definitely made the announcement that a \$1,000,000 steel mill would be established there for the manufacture of the material used in the immense ship yard of the Newport News Ship Building & Dry Dock Co. It will be devoted exclusively to structural steel and will not manufacture armor plate. In this connection it is interesting to note that the new \$1,000,000 dry dock in the ship yard will be ready for use by Dec. 1. Mr. Huntington was accompanied in the inspection of the properties by President C. B. Orcutt of the ship building company and Mr. R. P. Schwerin, vice president of the Pacific Mail Steamship Co. A careful inspection of the work on the two great Pacific Mail liners, now in course of construction, was made.

Mr. Huntington in discussing his visit and plans said: "I am down here simply to look over the plant and see what progress is being made on our ships. A sort of regular trip, you know. I like Newport News

above the new ones recently completed. That will give us facilities for building two more large ships in addition to those we now have. The big dry dock is a very important improvement and that will be ready by December at the latest. There are always times when ship builders feel the need of more than one dry dock, and when the new basin is completed we will be better equipped in this respect than any other yard. Our present dock is large enough to accommodate the largest of the merchant ships built in this country and the large majority of ships in the foreign trade, but they are now building 700-foot ships abroad and we must have a dock large enough to receive them. This will be the only dock, in fact, that can accommodate these leviathans. While I cannot say that we will always have sufficient repair and new work to keep both docks busy, we are continually feeling the need of another basin and there will be considerable activity around both docks after December."

"Does the Pacific Mail contemplate building any more ships very soon?"

"Well, hardly, at this time. You know, we purchased three large ships a short time back and we are now having two palatial vessels built here for our China trade. I made a trip through the yard noting the progress on the new dock and the ships under construction. The work



JOINER, CARPENTER AND WOOD FINISHING SHOPS AT THE BATH IRON WORKS, BATH, ME.

and always look forward to my visits here with a certain degree of pleasure, though my time is pretty well taken up with matters of business. The city today is more than what I expected of and predicted for it. Here you have the natural location. It is in the right place and is sure to forge ahead to the place it deserves."

"Has the ship yard any new ship contracts in sight?"

"Well, to that I can say that it has and it has not. Some want us to bid on ships, and we may do so. At this time there is nothing to give out. Of course, a lot of government contracts will be let very soon, but there is not much money in them. They serve, however, to keep the men busy and we shall bid on some of the ships. In 1894 I lost more than \$100,000 on the first two government ships we built, but, of course, I bid low on them purposely and kept the men at work."

"Will you submit bids on all fourteen of the new warships to be let out?"

"Hardly. I would like to build the five battleships—that is the number, I believe. We may bid on the six armored cruisers, but our plans are not definitely laid yet and I do not care to say too much concerning them. You see I can take here as many contracts as I want, as I can extend the yard to the north without difficulty and keep on building cranes, if necessary."

"What improvements, if any, are contemplated for the yard in addition to those now under way?"

"None to speak of. I shall build another steel ship crane out there

on the Pacific Mail liners has been very satisfactory and in from six to nine months one of them should be in service."

"Are there any new developments in the steel plant project?"

"I shall build a steel plant, but I will not say when just now—not that I cannot, but that I do not care to. I have selected the site and it will be on the land opposite the ship yard. The plant will cost \$1,000,000 or more and will probably be built on either side of the tracks leading from the Chesapeake & Ohio into the yard."

"What about the armor plate plant? It was reported that you would build a plant for the manufacture of warship armor in conjunction with a steel mill."

"Why should I want to build an armor plate plant? A ship builder has no business making armor. If he did embark in that he would not find a market for it outside of his own plant, as the other yards would not use it. It was reported some time ago that Carnegie intended to build a ship yard. He has no idea of doing so, and his reasons are purely business ones. The ship builders have enough to do to turn out ships."

"How do you regard the ship building outlook in general?"

"Very favorably. The prospect is good for unprecedented activity in ship building. We have not the merchant marine we should have, and the day must come when we will take rank as one of the leading nations in this respect. To do this we must build ships. Then, too, our navy is small yet and must be increased. The American ship yards should be kept busy for some time to come."

IMPROVEMENTS AT BROOKLYN NAVY YARD.

Nearly \$2,000,000 is to be spent in improvements at the Brooklyn navy yard. Of this sum \$1,000,000 will be applied to the construction of one of the finest and biggest dry docks in the United States. This dry dock will be so enormous that two ordinary cruisers can be floated into it and repaired simultaneously. The soundings and borings for this mammoth structure have been in progress for weeks. Besides the dry dock there are to be a huge store house and a railroad on which freight may be shipped from one end of the navy yard to the other. Admiral Endicott has found that the Brooklyn navy yard has suffered more from fire than any other in the United States. In consequence a thorough reorganization of the system of fire protection for the yard is to be effected. A series of pipes will be run in all directions connecting with all the present buildings and those to be erected. Connected with the pipes at the water front will be powerful pumps. Having all the resources of the East river, there never should be any inadequacy in the supply of water. Thorough paced fire drills and a quick working signal system will be depended upon to avert future conflagrations, like the \$900,000 fire in the pattern and tool house last winter.

The historic old ferry, one of the most picturesque attributes of the place, is also to go. The old order giveth way to the new, and a steel bridge is to supersede the clumsy boat which has made its way in tedious oscillation across the channel by means of a hawser or chain for these many years. The bridge, which will cost \$115,000, will be swung out of the way when vessels are shunted toward the dry docks.

At a cost of \$80,000 a pumping station is to be built for dry dock No. 3. It will be of the best modern type, with improved machinery. The new appropriation will also enable the navy department to put in the last of the stone quays about the Whitney basin. This work has been under way for years and has cost the government about \$500,000. About \$50,000 will be expended in this direction. An appropriation of \$185,000 will be used to reconstruct "building No. 21," as the small boat shop is officially designated. The need for dispatch boats, launches and cutters is growing so rapidly with the addition of the Kentucky, the Kearsarge and other new warships, that more facilities for small boat construction are imperatively needed.

The electric light and power plant in the navy yard is to be extended at a cost of \$25,000, and the surgeons' quarters and dispensary offices are to be improved under a \$12,000 appropriation. The old circular building where the crowds of workers gather each day is to be replaced with an adequate modern paymaster's office. The railroad system will use up \$30,000 of the \$2,000,000 appropriation. The new store house will cost \$150,000. When this is ready, munitions of war, provisions, etc., will be transferred with greater celerity, and "hurry orders" to fit out a vessel will be executed with ease as against the delays and hindrances encountered now.

THE W. & A. FLETCHER CO.

The plant of the W. & A. Fletcher Co., Hoboken, N. J., is crowded with work. The growth of the firm has been steady and the plant now covers an entire block. At the present time this concern is busy building the machinery for the ferryboats John Englis and Harry B. Hollins for the New York & Brooklyn Ferry Co. and the West Point & West Shore R. R. Co. These three ferryboats' hulls were sublet to T. S. Marvel & Co. by the Fletcher company, who have the contracts for the boats complete. This company recently furnished the new American-Hawaiian Steamship Co.'s steamer American with four boilers, and are also building the same number of boilers each for the Oregonian and Hawaiian of the same line, all three being constructed by the Roach's. They will also have the engines and boilers they are building for the Boston & Bangor Steamboat Co.'s steamer City of Rockland ready in a couple of months. This boat's hull is being constructed by McKie of Boston.

The repair business of this corporation is exceedingly satisfactory. They have recently overhauled the machinery of the ferryboat Dakota of the New York & Brooklyn Ferry Co., and in addition this boat has had new joiner work built and otherwise renovated, so that she is as good as new. It is gratifying to see the interest which the new management of this ferry company, under the leadership of John Englis, has taken in building new boats and repairing the old ones to a standard never before reached in its history. For some time the big Sound steamer Connecticut has been at the Fletchers' having her engines partially rebuilt, and when completed it is believed that the chronic breaking down of this boat's engines will be overcome. Repair work has just been completed on the New Jersey Central Railroad's tug Honeybrook, also repairs to machinery to transfer tug No. 12 of the New York Central R. R. Co. The new brass foundry built since the fire at these works is a model in every respect, and its addition makes the plant second to none in the country for marine machinery building. It is the general opinion that the W. & A. Fletcher Co. take more contracts for building entire steam vessels, hulls and machinery, than any other concern in the United States that has not a ship building plant.

A TRIPLE LAUNCHING.

Favorable progress is being made on the three torpedo boat destroyers Barry, Chauncy and Bainbridge now building at the Neafie & Levy ship yard, Philadelphia. It is the intention of the Neafie & Levy firm to have a triple launching next spring, on which occasion the three torpedo boat destroyers will glide from the ways one after the other.

Heretofore ship builders in the United States have not attempted to launch more than two vessels on the same day. In the launching of the Barry, Chauncy and Bainbridge, Vice President Sommers N. Smith of Neafie & Levy company, expects to set a pace for other ship builders in this country. When completed the three destroyers will represent the highest type of their class afloat. They are designed with a view of making high speed, combined with the most effective destroying power. The approximate cost of the three vessels is nearly \$900,000.

A board of naval officers will be detailed by the commandant of the New York navy yard to report upon the most suitable location for the dry dock at New York. Constructor Bowles has reported in favor of a site between dry docks 2 and 3. He will be a member of the site board. Congress at its last session authorized the construction of a granite and concrete dry dock at New York, placing the limit of cost at \$1,000,000.

ENORMOUS VOLUME OF FREIGHT.

The statistical report of the lake commerce passing through the American and Canadian ship canals for the month of July shows that the freight tonnage amounted to 4,101,765 tons, or 5,837 tons less than the record for the month of June, which broke all previous records in the canal history. The falling off is less than a single cargo of some of the larger freighters and hence the month's business is a marvelous one, exceeding the traffic of July, 1899, by over 600,000 tons. The total gain in the movement of iron ore to Aug. 1, 1900, as compared to Aug. 1, 1899, is 1,784,087 tons.

The gain is general in the movement of all freights to and from Lake Superior. It aggregates 12,775,246 tons as against 10,433,875 tons to Aug. 1, 1899, and 9,568,599 tons to Aug. 1, 1898. This is an increase of 2,341,371 tons over 1899 and 3,206,645 tons over 1898. Full summaries of the canal reports follow:

MOVEMENT OF PRINCIPAL ITEMS OF FREIGHT TO AND FROM LAKE SUPERIOR.

ITEMS.	To Aug. 1, 1900.	To Aug. 1, 1899.	To Aug. 1, 1898.
Coal, anthracite, net tons.....	317,363	392,523	193,535
Coal, bituminous, net tons.....	2,111,187	1,227,038	1,630,568
Iron ore, net tons.....	8,258,822	6,474,735	5,778,122
Wheat, bushels.....	23,865,065	21,076,558	10,101,450
Flour, barrels.....	2,559,913	2,570,878	2,553,253

REPORT OF FREIGHT AND PASSENGER TRAFFIC TO AND FROM LAKE SUPERIOR, FROM OPENING OF NAVIGATION TO AUGUST 1 OF EACH YEAR FOR THREE YEARS PAST.

EAST BOUND.				
ITEMS.	Designation.	To Aug. 1, 1900.	To Aug. 1, 1899.	To Aug. 1, 1898.
Copper	Net tons....	59,801	45,343	62,246
Grain, other than wheat	Bushels....	6,160,238	13,841,379	12,206,691
Building stone	Net tons....	10,616	12,655	3,537
Flour	Barrels....	2,559,751	2,570,858	2,552,353
Iron ore	Net tons....	8,258,822	6,474,735	5,778,122
Iron, pig.....	Net tons....	10,163	13,319	18,032
Lumber	M. ft. b. m.	368,069	421,210	383,117
Silver ore.....	Net tons....	.....	.....	.....
Wheat	Bushels....	23,865,065	21,076,558	10,101,450
Unclassified freight	Net tons....	22,946	71,697	111,292
Passengers.....	Number....	11,704	10,271	8,393

WEST BOUND.				
Coal, anthracite.....	Net tons....	317,363	392,523	193,535
Coal, bituminous.....	Net tons ..	2,111,187	1,227,038	1,630,568
Flour	Barrels	162	.....	902
Grain.....	Bushels	5,584	14,500	4,815
Manufactured iron.....	Net tons....	64,933	57,246	119,126
Salt	Barrels	101,193	158,419	143,341
Unclassified freight.....	Net tons....	196,619	185,560	180,823
Passengers.....	Number ...	12,386	12,053	10,474

SUMMARY OF TOTAL FREIGHT MOVEMENT IN TONS.

	To Aug. 1, 1900.	To Aug. 1, 1899.	To Aug. 1, 1898.
East bound freight of all kinds, net tons.....	10,069,802	8,517,607	7,422,495
West bound freight of all kinds, net tons.....	2,705,444	1,886,268	2,146,104
	12,775,246	10,433,875	9,568,599

Total number of vessel passages to Aug. 1, 1900, was 9,344 and the registered tonnage 11,075,772.

AN INTERESTING FIGURE IN AMERICAN SHIP BUILDING.

An interesting figure in the history of American ship building is Mr. A. C. Small of Jacksonville, Fla., who was formerly a Maine ship builder. He is at present visiting his old home in Cherryfield, Me. Early in the fifties he was concerned in building the three-masted schooner Augusta Brewer; also the Emeline and the brig Robin, the latter craft being well remembered by old coasting captains. He was afterwards associated in the business with the late Amos Dyer, and among their build was the brig Lucretia and the bark Wanpanaug. In 1857, the year of the financial crisis in the United States, he went to Jacksonville, where he built the American Eagle, a bark of 400 tons, which was sold to New York parties, and during the rebellion was seized and labelled by the United States government for having been engaged in carrying coal to the confederates. When the war came on in 1861, Mr. Small was then a resident of Jacksonville, but a year after, when the government had established a hold in South Carolina and made Port Royal a base of operations, he was given charge of the work of repairing the fleet, which position he held until the close of the war in 1865. Since then he has resided in Jacksonville where his services as a vessel builder and skillful millwright are always in demand.

The Marine Coal Co., Pittsburg, a new river coal concern, will in a few weeks let a contract for a towboat and thirty flats. It is probable that Capt. C. W. Posey will superintend the construction of the boat. Its engines will have 15-in. cylinders and a 5-foot stroke.

THE BATTLESHIP OF THE FUTURE.*

By F. C. Goodall, M. I. N. A., and A. C. Holzapfel.

In placing this subject before this important assembly, we must at the outset state that we cannot deal with it from the authoritative standpoint of competent experts in naval artillery and armor plates. A great advance in the size of mercantile vessels has, however, proved that in increasing the size of the ships the naval architect meets with no serious obstacles in their construction and we venture to hope that in placing this subject before you in outline only, and without authoritative details, we may meet with your indulgence.

Since the present type of battleship was introduced by the building of the *Dandolo* and *Duilio*, of about 11,000 tons, and built twenty-four and twenty-two years ago in Italy, several important changes have taken place in the manufacture and resisting power of armor plates, and in the construction and penetrative power of heavy guns. The rapidity of this progress is strikingly illustrated by the fact that the results of the elaborate experiments made at Bethlehem under the supervision of Mons. L. E. Bertin, one of our hosts here, and on which M. Bertin read a most interesting paper in London in 1897, have already been superseded by very material improvements, both in armor and ordnance. Changes have also taken place in the size and design of battleships since that period, but, on careful review, it will be found that they have not been nearly so far reaching as the changes or improvements in armor plates and artillery. Thus, for instance, the *Italia* and *Lepanto*, vessels of close on 14,000 tons displacement, were built eighteen and twenty years ago at a period when armor plates were immensely inferior in their protective power to the latest quality produced. These vessels, the *Italia* and the *Lepanto*, are of similar dimensions to the latest British ironclads of 15,000 tons displacement, but their coal endurance is considerably smaller. Practically speaking it may be said that no substantial increase in the dimensions of battleships has taken place since they were built.

Other navies, which do not anticipate operating so far from their bases as Great Britain, have adopted a much smaller coal endurance, in consequence of which the sizes of most of their battleships vary between 10,000 and 12,000 tons displacement. It cannot, therefore, be said that any very material increase in the size of battleships has taken place during the last eighteen years. During that period, however, the struggle for superiority between armor plates and heavy artillery has continued with varying success for the one side and the other. Naval guns of 100 and 120 tons have been discontinued as unsuitable, and the heavy ordnance now constructed in Europe for battleships is a 30-centimetre (12-in.) wire-bound gun of about 46 tons weight. This gun, however, has a higher velocity and penetrative power than any gun previously constructed. Even a 30-centimetre (12-in.) gun is considered almost inconveniently large, and the German naval department has limited, or is about to limit, itself to the 24-centimetre (10-in.) gun, and thus to give up the struggle of gun versus armor plate, as a 24-centimetre (10-in.) gun of the most modern construction is not able to penetrate the most modern type of heavy Krupp armor plate. The tendency of modern gunnery experts has been to increase the number of small guns and to adopt as far as possible quick-firing guns capable of throwing a large amount of metal, while not able to penetrate the thickest armor of the modern battleship. The largest quick-firing gun is of 20 centimetres (8 in.) calibre, and therefore very close up to the size of the heaviest guns now favored in Germany.

The hopes of expert artillerists of damaging an ironclad seem, therefore, to consist chiefly in throwing a large amount of metal by quick-firing guns which will pierce the unprotected ends and the thinner parts of the armor, also in damaging the heavy armor by melinite and lyddite shells, as the shock of their explosion, while not able to pierce it, would strain the part of the ship hit by such a shell and tend to loosen and shear the bolts by which the armor is held in place. At this point the question would arise whether the construction of vessels with armor plates, in view of the many drawbacks resulting from their use, is advisable at all, particularly in view of the steady advance in the manufacture and employment of high explosives; still the continuance of the employment of armor plates as a side protection for battleships by all great powers points to a consensus of opinion that armor plates will for a long time prove a valuable resistance to gun fire, but, if this opinion is correct, then let us consider whether in the battleships of the present day the fullest possible advantage is taken of the latest type of armor plates. There are those even now who considered our present battleships too large, and who quote the destruction of that part of the Spanish Armada, which escaped the gales, by the smaller vessels of Queen Elizabeth. But there is all the difference between wooden vessels of the line and modern battleships. The former, whether large or small, could be easily penetrated by the guns of those days, particularly at the close ranges at which they fought. The vulnerability of a battleship, however, allowing speed and ability to be the same, depends upon her size. The larger she is the thicker the belt she can carry. Assuming that two ironclads of 7,500 tons displacement each, attacked one ironclad of 15,000 tons, the former two having together the same armament of the latter and all three having the same speed, the following figures would enter into account: each of the smaller ironclads would have to have 66 per cent. of the indicated horse power of the larger one to go the same speed; her weight of engines, boilers and fuel would therefore be at least 66 per cent. of that of the larger vessel, and she would consequently have to carry considerably less than half the weight of armor of the larger vessel. The length and depth of the belt required by such a vessel would be considerably more than half the superficial area of that required by the larger vessel; so that, if figures are actually worked out, it will be found that the thickness of the belt in the smaller ironclad will be only half that of the larger one, unless, indeed, the smaller vessel were largely unprotected in parts where the larger vessel is protected. She would, therefore, be readily penetrated by the secondary armament of the larger vessel, while the midship or vital parts of the latter would be proof against all except the heaviest guns of the two smaller vessels. But the two small vessels would be under the further disadvantages that together they would require a larger crew for working them, and the joint initial cost and the cost of maintenance would be considerably in excess of that of one large vessel.

It will therefore be seen that in connection with ironclad steamers considerations prevail which were absent in the case of the wooden sailing vessels of the line of former times. At present the armor belt employed

by most navies varies from two-fifths to four-fifths of the length of the vessel, dips 1.20 metres (4 feet) to 1.80 metres (6 ft.) under deep load line, and rises 1.80 metres (6 ft.) to 2.40 metres (8 ft.) above water, and it varies from 10 centimetres (4 in.) to 30 centimetres (12 in.) in thickness. A vessel so protected is, under certain circumstances, vulnerable in any part by the latest 30-centimetre (12 in.) wire-bound Vickers-Maxim gun; in all parts except the midship portion of the armor belt by the 15-centimetre (6 in.) quick-firing gun; in the extremities, in the upper works, and, while rolling in a heavy sea, below her armor, by any of the smallest naval artillery now in use. She has, therefore, sacrificed speed, seakindness, stability and handiness, and has expended an enormously increased initial cost for an advantage which is largely illusory. In the battle of the Yalu, as well as in the late Spanish-American war, all execution was done by artillery, the use of the torpedo and ram having been relatively valueless.

Having now arrived at a period when armor plates of certain thicknesses can be made, which would be practically impenetrable by any artillery hitherto constructed or invented (excepting only the American dynamite gun, which has hardly come within the reach of practical discussion), the question arises whether it would not be wise to construct battleships so protected by armor plates that they will be practically impenetrable by artillery. Naturally this would mean the employment of a belt of uniform thickness running from stem to stern, and to a greater depth under water than has hitherto been in vogue, so as to practically preclude the possibility of the vessel being hit below the belt. It would practically mean the trebling of the weight of armor plate as used in the present day ironclad, and, therefore, an increase in size to something like 31,000 tons displacement. This would, of course, mean an enormous stride forward in the size of warships, but a displacement of 31,000 tons would not exceed that of the *Great Eastern* or the *Oceanic*, while at the time the *Italia* and *Lepanto* were built they exceeded in displacement any mercantile vessel then built, except the *Great Eastern*; in fact, while battleships have been practically stationary in size during the last twenty years, mercantile vessels have more than doubled in size. Dock entrances would of course have to be widened to accommodate such vessels, and possibly new dry docks would have to be built. But now let us consider what would be the advantages.

First.—Until such time as either more effective artillery or more powerful explosives than at present are in use, such vessels would be practically proof against artillery fire from other warships, and from land batteries and forts.

Secondly.—Assuming that we double the size of the largest ironclad afloat and build vessels of about 31,000 tons displacement, such vessels, while carrying about three times the weight of armor of the ironclad of the present day, would require only 50 per cent. additional weight and space for engines, boilers, and fuel to attain the same speed as the existing ironclad, or alternatively could be driven at a higher ratio of speed than the ironclad of the present day.

Thirdly.—They could carry a considerably increased number of heavy guns capable of sinking vessels of inferior type, and would have a much steadier platform and greater stability than ironclads of the present day.

Fourthly.—Having probably doubled their gun power and immeasurably improved their defensive power, the addition to the crew and increased cost of keep up would be only 50 to 60 per cent. over that of the present day ironclad.

Fifthly.—Through increase of size the number of watertight compartments would be very largely increased, and therefore the danger of being sunk by torpedo or ram would be proportionately diminished.

Sixthly.—The crew, knowing the ship proof against perforation by gun fire, would be able to work her with greater confidence and safety.

In order to illustrate approximately this type of vessel, we suggest a vessel of the length of 180 metres (600 ft.), of a beam of 30 metres (100 ft.), and of a draught of 8.4 metres (28 ft.), having a displacement at about a co-efficient of 0.65 of 31,000 tons.

To protect such a vessel against artillery we would propose an armor belt of a thickness of 50 centimetres (20 in.) from stem to stern, of a depth of 3.6 metres (12 ft.) at the ends ranging to 4.8 metres (16 ft.) amidships, of Krupp armor steel of the latest type. This belt would weigh approximately 6,700 tons. We can appreciate, of course, the drawback to a vessel's behavior at sea due to having a weight of armor in the ends, but it must be considered that the armor will taper at the ends, where the weight will consequently be less than amidships. Considerations of stability we believe impose limitations on the position and thickness of the conning tower in some of our present day ironclads; in such an ironclad as we propose there would be such a large margin of stability that such considerations could fall away. It will be apparent to every naval architect that the remainder of the displacement (after deducting the 6,700 tons of side armor) of over 24,000 tons will be ample for the weight of the hull, for sufficient machinery, boilers, and fuel to drive her at a speed of about 18 knots, and for a suitable armor deck, for the guns, ammunition, stores, etc., but we would not presume at this place to go into further details on this subject.

In bringing this matter before the congress we have merely ventured to indicate as shortly as possible that the evolution in armor plates and guns which has recently taken place, and the enormous increase in the size of merchant vessels, have brought the desirability and possibility of constructing larger ironclads which shall be practically proof against all ordnance hitherto constructed within reach of the naval architect, and we would beg the members to favor us with their criticisms on this subject, which more than anything else will give this paper its value.

Although nothing of a definite nature has yet been decided as to the proposed change of the naval station at Port Royal, S. C., from that city to Charleston, there seems to be a disposition on the part of naval officers to expedite the transfer. The board of naval officers recently appointed for the purpose of examining into the respective facilities offered by the two cities for a naval station and to report to the secretary of the navy as to the advisability in making the change, held a special meeting on July 31 for the purpose of granting a hearing to Mayor Ager Smythe of Charleston on the subject of various sites offered by his city. Maps and special surveys of six sites were submitted to the board by the officials, who explained in detail the facilities offered by each. It is expected that a decision will be reached by the board in the near future.

*Read before the Congress of Naval Architects in Paris, Friday, July 20.

BELLEVILLE BOILERS.

Few people have any idea of the extent to which the Belleville boiler has been fitted in vessels of the British navy during the past few years. In 1893 installations of these steam generators aggregating 53,500 I. H. P. were fitted; in 1895, 106,000 I.H.P.; in 1896, 169,500 I.H.P.; in 1897, 27,300 I.H.P.; in 1898, 220,300 I.H.P.; last year, 1899, 317,400 I.H.P.; making a total of 893,900 I.H.P., a truly remarkable figure. These boilers are fitted on eighteen first-class battleships, the power of each varying from 13,500 to 18,000; on thirty-one large cruisers, the I.H.P. of these, varying from 10,000 in vessels of the Gladiator class to 30,000 in vessels of the Drake class. The boilers have been fitted on seven gunboats varying from 1,400 to 3,500 I. H. P., and on the royal yacht Victoria and Albert, which has an installation of 11,000 I.H.P. Fifty-seven modern vessels of the British navy, or practically all the large vessels built during the past five years, are fitted with the Belleville boiler. Some of the installations in these vessels are tremendous in extent. For instance:

Four vessels have 30,000 I.H.P. each.
Two vessels have 25,000 I.H.P. each.
Four vessels have 22,000 I.H.P. each.
Six vessels have 21,000 I.H.P. each.
Ten vessels have 18,000 I.H.P. each.
Four vessels have 16,500 I.H.P. each.
Six vessels have 15,000 I.H.P. each.
Six vessels have 13,500 I.H.P. each.
One vessel has 11,000 I.H.P.
Seven vessels have 10,000 I.H.P. each.

Belleville boilers to the extent of 122,000 I.H.P. are fitted in merchant vessels. The greatest installation is 7,200 I.H.P. and the least 600 I.H.P. Fourteen of the twenty-five merchant vessels fitted with this boiler have installations over 5,000 I.H.P. Forty vessels of the French navy, aggregating 371,320 I.H.P., are fitted with this boiler. The first vessel so fitted was the *Voltigeur* of 1,000 I.H.P., built in 1879. In the French navy three of the installations are over 20,000 I.H.P., one is of 19,600, two of 17,100, one of 15,500, three of 14,500, two of 14,000, two of 12,000 and one of 10,000. Thirty-one vessels of the Russian navy, representing 251,000 I.H.P., are fitted with the Belleville boiler; also ten vessels of the Japanese navy, aggregating 122,700 I.H.P.; five vessels of the Austrian navy, representing 56,700 I.H.P.; four of the Chilean navy, representing 26,500; one of the Argentine Republic of 13,000 I.H.P.; two Italian war vessels, aggregating 32,500 I.H.P., and one Spanish vessel of 11,000 I.H.P. The following table of vessels fitted with Belleville boilers cannot help but prove of interest:

	Vessels.	I. H. P.
British navy	57	893,900
French navy	40	371,320
Russian navy	31	251,000
Japanese navy	10	122,700
Austrian navy	5	56,700
Chilian navy	4	26,500
Italian navy	2	32,500
Argentine navy	1	13,000
Spanish navy	1	11,000
Merchant Marine	25	122,000
Total	176	1,900,620

COL. LYDECKER'S REPORT.

"Congress having, in the act of June 6 last, called for plans and estimates for doubling the commercial capacity of the St. Clair flats canal, a full special report in the matter will be prepared and submitted as soon as practicable," says Col. G. J. Lydecker in his annual report to the secretary of war, made public this week. "The last appropriation for the improvement of the canal was made in 1890, and a balance of \$3,059 is still available and will be used for repairing and extending the protecting pile work at the ends of canal dikes."

Col. Lydecker says that operations were under the ship channel appropriation in the summer and fall of 1899, and it was not deemed judicious to place an additional plant in that locality until these operations were completed, as it would tend to obstruct and endanger the large commerce passing through the narrow and crooked channels. For that reason action in relation to the commencing of work under the continuing contract system, as provided in the river and harbor act of 1899, was postponed until last spring. The bids were opened for construction of a 21-foot channel, and contracts have been awarded for work on the Lime Kiln crossing section, Ballards reef channel section and for time work by dredges at other parts of the river channel, where excavation is needed to obtain the same low water depth.

Work on the ship channel from Duluth to Buffalo was confined principally to the completing of channels through Round Island shoals in the upper St. Mary's, and a channel in lower Detroit river along the Grosse Isle lower range. The depth now available over the shoalest part of the ship channel is 18 1-2 ft. confined to that section of the Detroit river between the Lime Kiln crossing and the south end of Bois Blanc island.

The principal work in St. Mary's river was the construction of an extension of the crib pier in the northeast approach to Poe's lock and intended to provide a much-needed berthing place for vessels approaching the lock. In Hay Lake channel the work included a completion of the deepening of the Middle Neebish section, and of reinforcing the dyke adjoining that channel. This has given a 21 foot channel from the angle at the foot of Hay Lake to Lake Huron. Dredging in the Cheboygan harbor has resulted in an 18-foot channel 200 ft. wide in the Straits of Mackinac, which enables vessels to load 3 ft. deeper than a year ago. Dredging at Alpena harbor resulted in obtaining a 16-foot channel, an increase of 3 ft. Saginaw river now has a 16-foot channel through the bar at its mouth for about two-thirds of distance between curves of like depth in the bay and river.

The Nickel Plate road offers the low rate of one cent a mile travelled to Chicago for the annual encampment of the G. A. R. Tickets on sale Aug. 25 to 29, inclusive, good returning until Aug. 31 inclusive, or by deposit until Sept. 30 inclusive. Write, wire, 'phone or call on nearest agent, C. A. Asterlin, T. P. A., Ft. Wayne, Ind., or E. A. Akers, C. P. & T. A., Cleveland, O. 154, Aug. 29

A GREAT OCEAN RACE.

The four biggest, best and speediest of all the great ocean liners started from New York on Tuesday and Wednesday in a race across the Atlantic. Each is carrying mail, and on the time made in the rush across will depend a great deal in the making of the next contracts for speeding letters over the seas.

The four great leviathans that are making the run are the *Deutschland*, *Kaiser Wilhelm der Grosse*, *Oceanic* and *New York*.

The distances in miles to the first ports touched by the monster ships are: Plymouth, 2,962 miles; Southampton, 3,100 miles; Queenstown, 2,800 miles.

This great race started 10 o'clock Tuesday, when the *Kaiser Wilhelm der Grosse* of the North German Lloyd Line left the Cunard pier and started for Bremen via Cherbourg and Southampton. Wednesday morning at the same hour the big *Deutschland* of the Hamburg-American Line started from Hoboken for Hamburg, calling at Plymouth and Cherbourg as she goes up the English Channel.

About the time the *Deutschland* left her pier the *New York* of the American Line, which is carrying the bulk of the mail, started to Southampton direct. At 3:30 Wednesday afternoon the *Oceanic*, the largest ship in the world, left the White Star pier to go to Liverpool by way of Queenstown. Four such vessels have never left port for a 3,000 mile race within a comparatively short time of each other.

Steamship agents are excited over the possibilities of the marvelous contest of speed. Interest is connected with the *Kaiser Wilhelm der Grosse* as this is the first instance in which the gigantic *Deutschland* will have had a chance to start within 24 hours of the *Kaiser*, from which she recently took the record honors for ocean speed.

The *Kaiser Wilhelm der Grosse* will make her first call at Cherbourg and will then cross to Southampton. With the superior speed of the *Deutschland* and the fact that she is to go to Plymouth direct, a matter of only 5 hours from London, many think that the *Kaiser's* mails will not be in London many hours before those of the *Deutschland*, even allowing for the 24 hours' start between the two ships.

While the *Oceanic's* officers say the run homeward of the four big vessels will be exceptional for point of speed, size and carrying capacity, they deny that the *Oceanic* will be driven any faster than she was intended for, which is 21 knots. The *Deutschland* is a 23-knot boat, as against 22½ of the *Kaiser Wilhelm der Grosse*.

The *New York* has not this speed, but her going in the company of the big trinity is noteworthy in steamship circles because of the big consignment of mail she will carry. Half a dozen well-known business houses prepared letters to send by each ship to ascertain which one reaches London first.

NAVAL ELECTRIC CO.

The Naval Electric Co., with offices at 95 Liberty street, New York City, has been organized to succeed the B. & H. Electric Co. of Dansville, N. Y., and New Haven, Conn. The same officers continue, the change in name being made as more appropriate for the distinctive line of electrical business in which the company propose to engage. F. G. Hall, Jr., is the manager for the company and I. E. Burdick is secretary and treasurer. Both of these gentlemen have been engaged in electrical business for about ten years and have devoted their attention more especially to the application of electricity to naval and marine purposes. They are graduates of the Sheffield Scientific School, and at the beginning of the war with Spain came into prominence among scientific investigators by their joint invention of an arc light for use under water, and known as the Yale submarine arc lamp. This lamp has since proved its entire practicability for submarine use in connection with divers, and is being used by wrecking companies, dredging companies, dike and bridge builders, sponge and pearl fishers, in navy and dock yards, railroad docks, ship yards and by the United States and Russian governments.

Another specialty that is being placed on the market by this company is known as the B. & H. rapid-fire electric saluting yacht cannon. These are made after the style of the Hotchkiss gun and are meeting with popular favor among owners of fine yachts. The guns have a new electric firing attachment for firing from any part of a yacht. The company prepares specifications for marine electric lighting and power plants, in accordance with the national electrical code, and will make a specialty of the installation of marine electrical apparatus aboard ships and yachts. They will supply general naval electric specialties and staples, as search lights, hoists, dynamos, motors, engines, lamps, telephones, wires, cables, diving apparatus, signalling apparatus, submarine mines, yacht fixtures, naval, war and engineering supplies. The company has foreign connections and will purchase for export. Manufacturers are invited to submit prices.

PNEUMATIC TOOLS.

The Chicago Pneumatic Tool Co. reports a gratifying increase in its sales for the month just closed, over the corresponding month of last year, this being a repetition of its history from year to year since the organization of the company. The chief difficulty has been, and still continues to be, that of filling orders promptly. To correct this, the company has in course of construction at Detroit a very large and extensive plant, which it is hoped to have in operation during September. The recent opening of the Olney plant of this company, it was thought at the time would relieve the pressure somewhat, but the increase in business seems to outstrip the enlargement contemplated at that time; but, for the purpose of catching up with the orders now in hand, so as to cause as little delay as possible in filling orders during the removal of the plant at St. Louis to Detroit, the factories are working night and day, with a larger corps of employees than ever before.

Among the notable orders received during the month, after severe competitive tests, were the following: Entire order of the General Electric Co., Schenectady, N. Y.; entire order for the equipment of the addition to the Cramp ship yards at Philadelphia; entire requisition of the Philadelphia & Reading Ry; an order from the Maryland Steel Co. at Sparrows Point, Md.; entire order of Riter & Conley Co., Pittsburg, Pa.; besides large and increasing orders from foreign countries. During the month, the Richmond locomotive works adopted the Boyer drill as standard, placing an order for thirty-four No. 3 drills, in addition to the large number already in use by that company.

CHARLESTOWN NAVY YARD BUSY.

The great amount of work that is being done at the Charlestown navy yard at the present time, as compared with the long period of inaction which ended just before the declaration of war against Spain, is made easily comprehensible by a careful comparison of the number of workmen employed then and now. The average number employed each month during the year 1897 was about 450, but to make sure that the minimum is not taken the month of Jan., 1898, has been selected and inferences may be drawn from a comparison of the number working in the several departments of the yard at present with those employed that month.

The returns of the heads of the several departments of the yard for Jan. 31, 1898, show the total number of men employed to be 486, divided among the departments as follows: Yards and docks forty-six; construction and repair, 220; steam engineering, twenty-eight; equipment, 145; ordnance, five; provisions and clothing (now supplies and accounts), twenty-one; medicine and surgery, two. The returns for the departments for July 30, 1900, show a total of 1866 men employed. They are distributed among the several departments as follows: Yards and docks, 144; construction and repair, 1,086; steam engineering, 286; equipment, 278; ordnance, twenty-two; supplies and accounts, fifty.

These figures show that the total number of men employed in the yard on July 30, this year, is about four times as great as the total number employed on Jan. 31, 1898; and that the number employed in the department of construction and repair at present is over twice the whole force of the yard two years ago. The force at present employed is not so large as it was a few weeks since, or so large as it will be a little later, if some of the work expected is secured. When one considers the great amount of new machinery which has been installed within the past two years and the other improvements which have been inaugurated, the immense amount of work which is being turned out now can be appreciated.

This morning an order was received by Constructor Baxter for between thirty and forty boats, to replace those destroyed by fire recently. The list includes all classes of boats, from steam cutters costing about \$6,000, to dingys and punts which cost only a few dollars. This order is very large and will keep the boatshop crew busy for some time to come. There is a large force working in this shop now, but Constructor Baxter announces that he intends to buy a lot of tools for the shop and as soon as they are received the crew will be enlarged.

These ships are at the yard receiving repairs: Olympia, Scorpion, Mayflower, Dolphin, Machias and Topeka. The Hartford's repairs are finished and she has sailed. The Sterling, which has been out of commission for several months, will undoubtedly be fitted for use as a collier in Chinese waters. An order calling for estimates for doing this work has been received, and it was expected the men will be set at work very soon. If the job is authorized it will mean a very considerable addition to the yard force. The department of steam engineering would have to overhaul all the ship's machinery, a job which would take about two months under normal conditions and would necessitate the employment of a large force of workmen. The department of construction and repair would need about a month for overhauling all the woodwork and making what repairs are needed. Probably 300 would be required for the work. The hull of the Sterling is in first rate condition and would need little or no repairs. The other departments of the yard would have only a small amount to do, comparatively.

Estimates for repairing the gunboat Machias have been prepared and forwarded to the department at Washington, but as yet nothing has been heard from them. It has been rumored at the yard for some time that the Machias is to be put out of commission and that the Bancroft will be commissioned in her place. Of course, the idea is that one or the other of these ships is to be sent to China. If the department should put the Machias out of commission here it is more than likely that her repairs will be very extensive and will call for a large number of men to do the work. If not put out of commission only temporary repairs are to be made.

The outlook for the steady advancement in the navy yard is good; everything points to an increase rather than a decrease in the number of men employed. One reason for this awakening of the Charlestown navy yard is that it is situated in a highly advantageous position for securing the best class of skilled laborers. This fact the department recognizes, and is making an earnest effort to secure some of the best of these skilled mechanics and keep them permanently employed.

AN ADDRESS ON THE SHIPPING BILL.

A vigorous and excellent address on the shipping bill was delivered before the Trans-Mississippi Commercial Congress by Hon. John R. G. Pitkin of New Orleans, recently. One of his contentions was that the bill could not foster a trust. Among many things he said:

"It is not proposed, while increasing the earning power of our labor by reaching to more markets, to diminish that power in building and sailing the ship which is the reach. It is proposed to do for the ship building industry by subsidy what we do for other industries by tariff; to credit to ourselves the difference in the cost of labor here and abroad, and protect the hold as we protect the counter. The average difference in cost of operation is met in the provision of one cent per gross ton per 100 nautical miles sailed for the first 1,500, etc. Neither can the term of compensation of any vessel extend beyond twenty years, nor its annual entries for compensation exceed sixteen in number. The contract entered into with the government must be enforced by a secured penal bond, equal to \$10 per gross ton of the vessel, for its construction in one of our yards, its registry and readiness within five years; but no contract can be made after the lapse of ten years from the passage of the act, and no compensation can be applied save as the vessel responds to the terms of the bond, and after its tenth year of service the bounty annually shrinks 5 per cent. If shipowners combine to control freight rates, they forfeit all compensation under the bill; and if shipbuilders combine to control yard rates, foreign-built tonnage, under the terms already stated, replace the new products of such yards. In other words, no trust can ambush itself behind the measure to dictate a tax on either construction or carriage."

The cruiser New York, the flagship of Rear Admiral Farquhar of the North Atlantic squadron, is soon to be detached from the squadron and sent to the Brooklyn navy yard for repairs. If Admiral Farquhar's wishes are consulted the cruiser will not be remodeled.

NICARAGUA SEIZES THE CANAL.

No official information concerning the report from Managua, that the government of Nicaragua has seized the property of the Maritime Canal Co. has been received by the United States, but the government understands the situation well enough to appreciate the reasons which brought about this radical action by Nicaragua. Some time ago, after the government of Nicaragua had declared the concessions to the Maritime company forfeited and had granted a new concession to the Cragin-Eyre syndicate, the Maritime company became aware of the purpose of Nicaragua to seize its property and appealed to the United States to see it through. Under one of the articles of the concession the company and the government of Nicaragua may have recourse to arbitration in the event of just such differences, and an agreement was reached that arbitrators should be appointed. It was the failure of this attempt at arbitration in its preliminary stage that brought about the seizure.

In order to fully understand the situation now existing a brief review of the controversy will be helpful. The concession to the Maritime Canal Co. was made by Nicaragua in 1887, and a period of ten years after the completion of the surveys was given the company within which to complete the canal. Two years ago the ten years' period expired, and last year Nicaragua served notice on the company that its concession had been forfeited and that its property would be seized. Under article 48 of the concession, which provides for an extension of the period within which the canal should be completed if the delay has not been due to the fault of the company, an extension was applied for, but Nicaragua declined to grant it. Then the company demanded arbitration, as provided by article 55 of the concession, as follows:

"Any misunderstanding that may arise between the state of Nicaragua and the company in regard to the interpretation of the stipulations of this agreement shall be submitted to a court of arbitrators, to be composed of four members, two of whom shall be appointed by the state and two by the company."

It is further provided that if the arbitrators fail to agree they shall select a fifth member, or umpire, who shall decide. The Nicaragua government imposed as the condition of the arbitration that the company should appoint as its arbitrators citizens of Nicaragua. The concession made no such condition, the Nicaragua government basing its claim in that particular on the law of Nicaragua relative to the procedure of courts, which requires citizenship in Nicaragua as a qualification of an arbitrator. This law, however, was ex post facto with regard to the concession. It was not enacted until July 6, 1894, more than seven years after the concession had been granted. The United States government sustained the objection of the company to the requirement that the company's arbitrators should be Nicaraguans, and endeavored to induce the Nicaraguan government to consent to a change. Nicaragua refused, and no progress in the matter has been made. The time within which the arbitration was to take place expired recently, and the government of Nicaragua, by seizing the company's property, serves notice on the United States and on the company that the contentions have been denied.

The seizure was made under article 54 of the concession, which provides that if the company forfeit its concessions through failure to complete the canal within the time fixed or for other reasons the government of Nicaragua "shall enter upon possession in perpetuity of the canal of works of art, lighthouses, stations, deposits, stores and all the establishments used in this administration of the canal without being obliged to pay any indemnity to the company."

What this government will do remains to be decided, but it will surely protest against Nicaragua's arbitrary action, contending that the insistence of the republic on the appointment of an all-Nicaraguan arbitration commission was contrary to the spirit and the letter of the concession. A state department official said in regard to the action of the United States:

"This government will protect the rights of its citizens. We so far have only considered one right—that of arbitration. We have insisted that the company be allowed to name its own arbitrators and we continue to stand on that ground."

The despatch from Managua says that the Nicaragua congress met in regular session and confirmed the decision of the courts and the official declaration of the Minister of Public Works that the time granted to the Maritime Canal Co. of Nicaragua had expired and ruled that the concession was null and void. The seizure of the company's property was doubtless made in conformity with this decision. The company's cars, rails and other portable property, it is said, have been removed from the interior to Greytown.

ENGLISH LIGHTSHIPS.

Roughly speaking, lightships are only used where it is impossible or inexpedient—on account of the shifting nature of the shoal—to build permanent lighthouses, and the first one to be placed in position was the well-known Nore, in the year 1732. At the present time there are sixty round the British coasts. The English lights are painted red, and those on the Irish coast black, with the name in huge white letters on both sides. At the masthead there is a large wooden globe or cage called the day mark. The lantern encircling the mast is about ten feet high, and contains a number of argand lamps and reflections, twenty-one inches in diameter, arranged in groups on a frame, which a beautifully regulated clockwork apparatus causes to revolve, and the result is those brilliant flashes of light which practically spell the name of the light vessel to passing ships, for every light has some distinguishing characteristic, either in the period or color of the flash. Even when the lightship is rolling or pitching in a heavy sea the light remains horizontal, as the lamps and reflectors are hung on gimbals, so as to give them free play in all directions. Foggy weather entails additional work for all hands, as a powerful foghorn, driven either by steam or compressed air, is kept working while the fog lasts. By means of high and low blasts from the trumpet, the sailor is informed what lightship he is passing, each fog signal as well as each light having its own distinguishing characteristic.

Townsend & Downey christened their big Crandall marine railway last week by hauling out the sailing ship Vimeria of 2,163 tons at their new plant on Shooter's Island, Borough of Richmond, N. Y. This important event was properly celebrated by a large number of friends of the proprietors going down to this new and extensive ship building yard in the tug A. A. Sumner.

LIGHTSHIP No. 72 FOR THE DIAMOND SHOALS.

Lightship No. 72, building by the R. M. Spedden Co., Baltimore, Md., will be ready for service in October. She will be stationed off Cape Hatteras and is the staunchest craft of her kind ever constructed by the United States government. The lighthouse service of the United States has many interesting and notable chapters in its history, but none to surpass the story of the attempts to place a light at the Diamond Shoals. Nowhere along the Atlantic coast is there a point which has given as much worry to the lighthouse service, or fear to sailors of all nations. For a long time it has been known as more full of danger for navigators than any spot on the coast. So many have been the wrecks there that it has been called "the graveyard of the Atlantic." For nearly seventy-five years the government has been trying to find means to keep vessels off these shoals.

Of all these efforts none have been of permanent avail. The conditions there are peculiar and of such a nature as can not be met by the usual means of a lighting station. At the same time the extraordinary dangers here to shipping, because of these shoals, made it more than ordinarily necessary to warn vessels. So there was the problem to be solved, which is now to be happily solved, it is believed, in the new lightship.

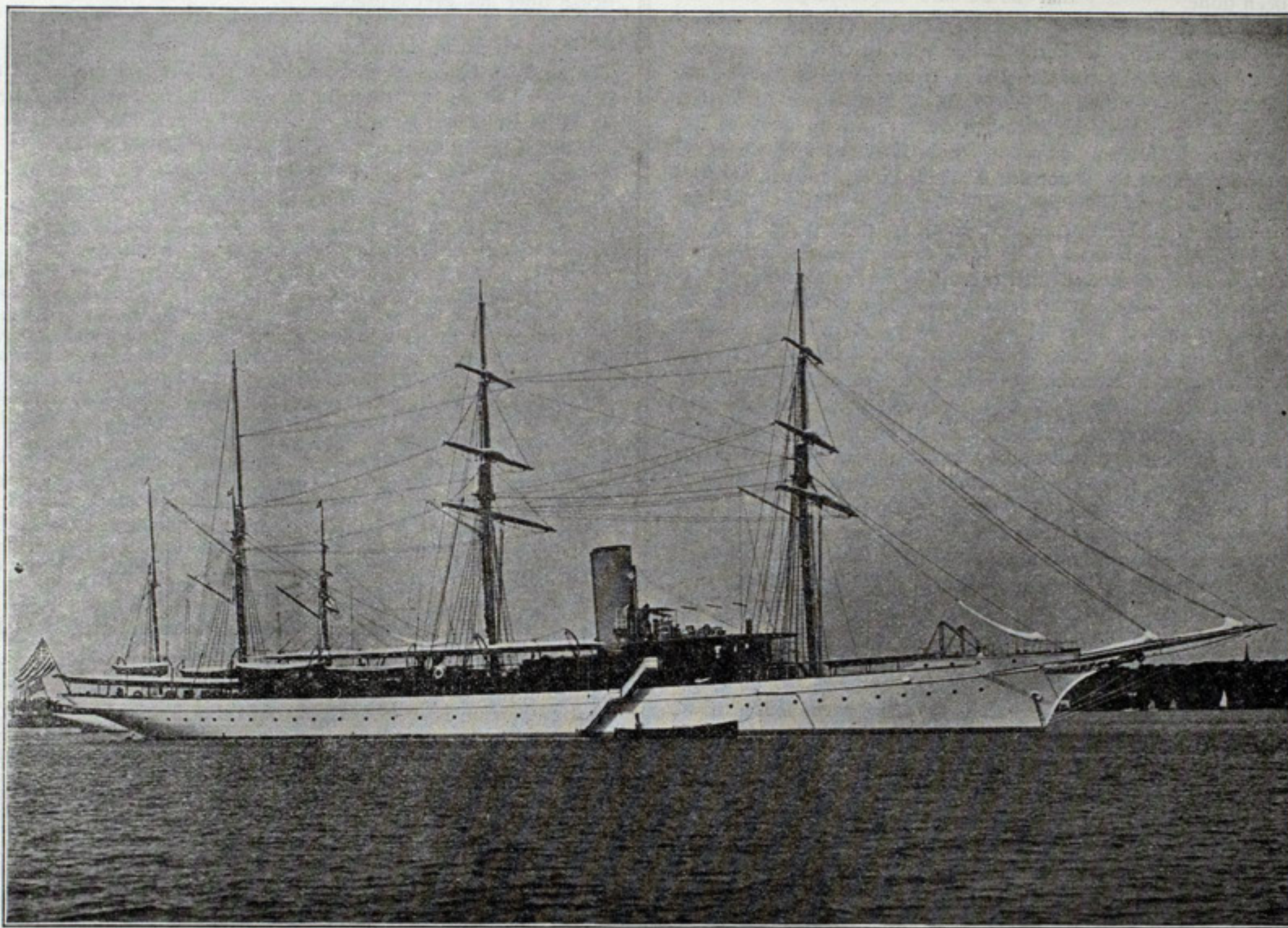
The location of the Diamond Shoals, and the terrible storms which occur there, make these shoals most dangerous. They are about ten

two electric lights of 600 candle power and a steam fog whistle, an enormous anchor, and, in short, considered a model lightship.

For some time she served, but finally she went ashore in a storm without great damage, though, was hauled off and replaced for duty till the new lightship is ready. The new ship will be called "No. 72," and while not unlike "No. 69" in appearance, she will be stronger and better fitted to resist storms. In her equipment there will be found results of all experiences gained by lighthouse experts while considering this vexed question of Hatteras.

The new lightship, which has been previously described in the Review, will cost \$75,000, will always have steam ready and will be able to move herself and go to sea if in danger of going ashore. A chain cable will anchor her to a mushroom anchor weighing 10,000 lbs., and she will ride under her own steam in a gale. Her anchor chain is the heaviest ever made, leads to a steam windlass and possesses a strong spring of steel, so that the ship will give under heavy seas and not be dead weight, as with ordinary anchors.

Besides this anchor she will carry a harbor anchor, weight 2,000 lbs.; a sledge, 350 lbs., and 120 fathoms of chain, each link $1\frac{1}{8}$ in. thick and with a breaking strength of 79,000 lbs., so she could hold her own though her anchor chain parts. She will have a steam foghorn and siren, a complete electrical apparatus, will be painted white and known as



STEAM YACHT APHRODITE, BUILT BY THE BATH IRON WORKS, BATH, ME.

miles at sea, from Cape Hatteras proper, and as a light on the shore is of little effect in a storm, and in foggy weather is quite useless. These reefs are in the Gulf Stream, and so are in the path of many vessels going north and south, so that in storms they are sources of peril to them.

The sands around the reef are always moving with currents, tides and storms, and when to this fact are added changes of wind and cross seas, the dangers of this spot may be faintly imagined. Look at a map, and it will be seen that Hatteras is the extreme eastern projection of that part, and here is a curve to the westward.

Masters of vessels sailing along the coast change their courses here. Worst of all terrors that the sailor meets here is the West India hurricane, which is the cause of most wrecks in this vicinity. This storm comes more frequently in the months of October and November from the islands of the Caribbean sea, traveling west until the Florida peninsula turns them aside to traverse the coast in destructive style. As Hatteras is exposed, it, with its reefs, receives the full force of these storms. When they are raging, the waves which break over the Diamond Shoals almost shake the rocks, and would carry away any lighthouse of the ordinary kind.

Such storms have arisen during the beginning of building lighthouses there and taken away the foundations. The first lightship at Diamond Shoals was a schooner-rigged vessel, held by an anchor and hempen cable, and carrying the best of oil light that could then be had. After a few years she went ashore and all on board were lost. Then came many attempts to erect lighthouses there, but all were failures. Every few years contractors would try to build, but they could not because of the seas.

Finally the government abandoned, for a time at least, any attempt to place a stationary light and decided to use a lightship. So such a vessel, known as "No. 69," was built and took her place near the reef in the autumn of 1897, the best craft of her class built up to that date. She had

"No. 72," with the words "Diamond Shoals Lightship" painted in black letters on her side.

"No. 72" will be about 118 ft. over all, about 15 ft. deep, and will have three decks, watertight steel bulkheads, staunch and seaworthy. She will be substantially fitted and furnished and her crew of ten men will be comfortable, with berths, galley and living rooms. Plenty of coal and large storerooms will be provided.

The hollow steel masts will carry wires through them for the mast-head electric lights, which will be visible eighteen miles away at sea in ordinary weather. The siren will warn vessels in heavy fogs. A feature of these lights will be a cluster of six 100 candle power lights with an electric flashing device, the most powerful ever displayed by any lightship.

TONNAGE TAX COLLECTION.

Tonnage tax collections during the fiscal year ended June 30, 1900, amounted to \$890,482 compared with \$834,087 for the previous fiscal year. The collections are the largest for any year since 1884, when these taxes were reduced to rates below those charged by the principal European nations. American vessels paid \$68,640 during the year. The penal tonnage taxes on vessels not in treaty with the United States, etc., were unusually large, \$36,712, as these charges were necessarily imposed on Cuban vessels, until congress granted relief by the act of Feb. 10. The excess charges on Cuban vessels have been or will be refunded under that act. By the Hawaiian territorial act vessels in trade between Hawaii and the rest of the United States since June 14 are exempt from tonnage taxes. Average annual receipts of about \$9,000 will thus disappear hereafter. Collections at Honolulu and sub-ports for two weeks in June, however, on vessels from foreign ports amounted to \$1,241. Congress also exempted trade between Porto Rico and the United States from tonnage taxes.

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The construction of armored cruisers for the navy, which for over a year was suspended, is about to begin again. Secretary Long has issued a circular calling for bids for the construction of six which were authorized in the two last naval bills. The suspension of the construction of this type was brought about by the controversy over the price of armor plate in congress. Much mischief was done by this controversy and more might have been done.

The circular calls for bids for all the cruisers, to be opened in December. The 1899 vessels may be either sheathed with wood or unsheathed, the department reserving the right to adopt either form of vessel; the 1900 ships are to be unsheathed. Both kinds of vessels are to have a bunker capacity of 2,000 tons; the sheathed cruisers are to displace not less than 13,800 tons; the unsheathed not less than 13,400 tons. Each vessel is to have an armor belt at the water line 7 ft. 6 in. wide, and from 5 to 6 in. thick; at the bow and stern the armor is to be 3½ in. thick. The protective deck is to be of nickel steel, 1½ in. thick on the flat and 4 in. on the slopes; and the side armor is to be 5 in. thick. The 6-in. guns on the main deck are to be protected further by splinter bulkheads, of 2½-in. nickel steel. All the wood on the vessels must be fireproof.

The main battery of each ship will consist of four 8-in. rifles, 45 calibers long, and fourteen 6-in. rifles, 50 calibers long. These very long rifles were first introduced into our navy on board of our foreign-built cruisers, the New Orleans and the Albany, and have proven satisfactory. The secondary battery will consist, in each vessel, of eighteen 3-in. rifles, twelve 3-pound guns, four 1-pound automatic guns, four 1-pound single shot guns, two 3-in. field pieces, two machine guns and six small automatic guns. Each ship will carry two torpedo tubes.

The six vessels will be fitted up as flagships. The vessels must be completed within three years, under a penalty of \$300 for each additional day up to thirty days, and \$600 a day thereafter. The minimum speed required by the contract will be 22 knots for each cruiser; if the speed falls below that, the department will accept the vessel at a reduced rate of \$50,000 a quarter knot down to 21½ knots; at the rate of \$100,000 a quarter knot for a speed of from 21½ to 20 knots. If the speed is below 20 knots, the vessel may be rejected or accepted at a still greater reduction, to be agreed upon.

The system of bounties for speed in excess of contract requirements has been given up, having served its purpose. The trial of the Russian cruiser Variag shows that our ship builders can estimate very closely on the work that their vessels shall accomplish; the bounty for excess speed is therefore unnecessary. But with its disappearance comes very properly the penalty for non-performance. The heavy penalty for delay in completion is certain to prevent any long delay, even though its possible imposition will be considered in preparing the bids.

It is to be hoped that the bids may be widely extended. The policy of the government in building and maintaining the navy has already resulted in developing the capacity of ship building plants in different parts of the country. If these concerns shall be able to undertake the construction of armored cruisers, even though they might not be able to handle battleships, the fact will be helpful to the country and speak clearly of the advantages already derived from the navy's growth. It is thus reasonable to expect that early in 1904 we shall find our navy enlarged and improved by six armored cruisers as valuable as their predecessors, and the best vessels of their type.

The lake trip of the committee on rivers and harbors of the house of representatives and of the committee on commerce of the senate has only begun and yet the members express their astonishment at what they have seen. It is already apparent that the trip will do them a world of good. It will broaden their understanding. It will be an object lesson in real life, the surest form of education. Not one of the members will hold the attitude toward the lakes that he has held hitherto. The panorama of moving ships which has passed before him is altogether too vivid to permit it. Senator Thomas S. Martin of Virginia, member of the senate committee on commerce, in discussing his impression said:

"This tour of inspection has been a continued series of revelations to me and to many members of the committee on rivers and harbors and it will undoubtedly result in wonderful good to the lake commerce of the country. There is not the least doubt in my mind that the next national congress will be infinitely more liberal in the matter of appropriations for improvements of harbors and ports on the great lakes than any congress has been in the past.

"Heretofore I have had no conception of the enormous amount of

business that is carried on in the cities and towns bordering on Lake Erie. While I knew that improvements were needed and while we have always been willing to make appropriations for needed improvements, I and many other members of the senate have had no idea of what the asked-for improvements mean, not only to the cities and towns on the lakes, but to the whole country.

"Words fail me when I try to express my pleasure and astonishment. The great ore docks at Ashtabula and Conneaut; the immense amount of shipping done at all of the ports we have visited, and the promise of even a greater surprise at Cleveland and other ports yet to be visited, convince me that the next congress will do more for the benefit of lake commerce than we had ever thought of doing before. And whatever I can do as a member of the senate for the building up of the lake commerce and for increasing the facilities for shipping on the great lakes, I will do."

The Russian cruiser Variag, built by the Cramps, is unquestionably the fastest cruiser afloat. She is a triumph of American naval architecture. She is faster than the fastest of ocean racers and it would be a striking achievement to send her across the ocean at full speed. Nothing could focus attention more quickly upon the Russian navy than the knowledge that one of its cruisers had crossed the ocean at a faster clip than any ocean liner had ever crossed.

The American marine is coming to the front. He was despised once. The seaman hated him because he was the representative of military discipline. The layman thought him of little account. But he proved his worth in Cuba and he is proving it in China. The creation of new naval stations makes necessary an added force of marines.

NAVAL MATTERS.

Bids for armor for the projected battleships and cruisers will be opened at the navy department on Friday of this week.

It is probable that the collier Southery, now at the Norfolk navy yard, will be placed in commission. Inquiries are being made as to her condition. She has not been in service since she was on the naval register during the Spanish war. The Southery has a capacity of 3,000 tons and carries two three-pounders. She is destined for service on the China station.

The navy department is getting ready nearly all its colliers for an emergency in China. The Leonidas and the Pompey have been ordered into commission and will be ready in six weeks. It will require that period to repair her. The cruiser Bancroft, now at Boston, will be placed in commission on Aug. 14. She will be used probably for service on the east coast of Central America and the Isthmus of Panama.

The boiler and machinery of the torpedo boat Stockton, under construction at the works of the W. R. Trigg Co., Richmond, Va., have been fully installed on board the vessel. The engines functioned very well under an air pressure of 80 lbs. per square inch above the atmosphere while in the erecting shop. It is believed the steam trials in the near future will demonstrate that these engines stand among the leading works of the country.

The vessels of the North Atlantic squadron will separate in a few days in order that some of them may visit ports in Maine where local celebrations are to be held. This makes the practical ending of the summer maneuvers. Several of the big ships, including the flagship New York, will go to navy yards for repairs and there will be no maneuvers until they are again ready for sea. The Indiana and the Kearsarge will be at Rockland, Me., from Aug. 8 to 11, the Kentucky and the Massachusetts at Bath, Me., from Aug. 11 to 14 and the Texas at Belfast, Me., from Aug. 8 to 11.

No date has yet been set for the official trials of the Wisconsin, but it is understood that they will be carried out before Oct. 1. The contractors are desirous to have the ship as near completion as possible before subjecting her to the government trials, and with this end in view will delay the tests until everything is on board, save some ordnance stores and the crew. The Wisconsin will not be fitted for sea at the Mare Island navy yard on account of lack of water at the yard. The installation of her guns and other outfits will be at the works of the builders, the Union Iron Works.

The Cunard steamship Iversia, on her maiden voyage from Queens-town, carried a record complement. She had forty saloon, 130 second-class and 1,800 third-class passengers. Her crew numbered 220, so that in the aggregate she had 2,190 people on board. The steerage, or third-class accommodation on this boat and on her sister ship, the Saxonia, are unusually fine and comfortable. These boats have quadruple expansion balance engines, twin screw, of 10,500 I.H.P. with Scotch boilers working at 210 lbs. pressure, and they have proved themselves good 16-knot boats and remarkably comfortable and steady.

Steamship Sonoma, one of three vessels being constructed for the Oceanic Steamship Co. by the Cramps, was launched on Tuesday, Miss Alice von Samuels christening the vessel. The first of these new vessels, the Sierra, was launched several weeks ago. The third, the Ventura, will slip from the ways in about a month. The dimensions of the new vessels are: Length between perpendiculars, 400 ft.; molded beam, 50 ft.; loaded draught, 24 ft.; displacement, 9,700 tons and I. H. P. 7,500. The contract speed is 17 knots. The engines are of the vertical, triple expansion type with twin screws.

After exhaustive experiments Major Giuseppe Rote of Spezie has decided that roughly speaking for speeds of 12 knots the depth of water required to afford no additional resistance to speed should be from six to eight times the draught of the vessel, when considered from 12,000 to 1,000 tons displacement, and at 22 knots the depth should be from eleven to sixteen times the depth of the mean draught. The results of his experiments are carefully embodied in curves and tables and are very interesting, showing the disadvantage attending speed trials in shallow water.

AROUND THE GREAT LAKES.

Hay Lake channel entrance gas buoy No. 35, St. Mary's river, Mich., which was reported as out of position, has been replaced in its proper position.

The McMorran Wrecking Co. of Port Huron has secured the contract for raising the schooner H. W. Sage, sunk recently near Harsen's island, St. Clair river.

Capt. Charles Bronson of the Goodrich liner Sheboygan has been appointed master of the private yacht of President A. W. Goodrich and will remain on her as long as she is in commission.

The elevator capacity at the head of the lakes is to have another increase. The Great Northern railroad will tear down its elevator A, which is a wooden structure with a capacity of 1,750,000 bushels, and on its site will put up a modern steel elevator with a capacity of 2,500,000 bushels.

Repairs to the fireboat Cleveland of Cleveland, costing about \$15,000, will be made shortly. Among the successful bidders are Thomas Manning, Jr., & Co. for pump alterations, Cleveland Steam Boiler Works for boiler and machinery alterations, and Murphy & Miller for hull repairs.

There is, of course, nothing in the rumor that the Maythams, tug owners of Buffalo, will have several steel tugs built at West Superior. If the Maythams were figuring with the American Ship Building Co. for new tugs, their negotiations would be with the main office and not with the branch interests at West Superior.

The consolidated steamboat fuel interests (Pittsburg Coal Co.) have some opposition in Cleveland. A new organization, known as the Ohio Fuel Co., has a dock and other facilities in the old river bed district, close to the main river, and has begun business with T. H. Ramage as agent. Mr. Ramage was formerly with Osborne, Saeger & Co.

Statistics of iron ore shipments compiled in the office of M. A. Hanna & Co. show that 3,038,560 tons were transported in July, 1900, as against 2,902,867 tons in July, 1899, a gain of 135,693 tons, or an increase of 4.67 per cent. The total shipment to Aug. 1, 1900, is 9,454,400 tons as against 7,656,823 tons to Aug. 1, 1899, a gain of 1,797,577 tons, or an increase of 23.48 per cent.

In accordance with the reduction in lake freights from Lake Erie ports to Chicago, the Youghioghny & Lehigh Coal Co. of Chicago has reduced prices of steamboat fuel as follows: At north pier—Youghioghny screened lump, \$3.50 a ton; unscreened, \$3.40; screened nut, \$3.25; screenings, \$3. At south pier—New Kentucky lump, \$3.25; Buck Horn egg, \$3.10; screenings, \$2.75.

President F. H. Clergue, for the Algoma Central railroad, has secured the local stock in the old Hudson Bay & Sault Ste. Marie Railway Co., acquiring its charter and privileges. The charter gives the company the right to construct a road from Missanabie to Moose Factory, located on Hudson Bay, and carries with it a subsidy of \$500,000 and 1,250,000 acres of land along the proposed route.

The River Improvement Association of Chicago has selected J. S. Dunham, Murry Nelson, T. T. Morford and J. G. Keith as a committee to arrange for the entertainment of the congressional committees on rivers and harbors when it visits Chicago on Aug. 21, at the end of its tour of the lakes. This committee will act with the board of trade and drainage board in taking care of the visitors during their stay.

On or about Aug. 8, 1900, the remains of the four cribs in the 20-ft. dredged channel, Lake St. Clair, which are now marked by gas buoys Nos. 1, 8, 13 and 19, will be marked by placing over each crib as near as possible a barrel buoy painted half red and half white and marked with the name and number of the crib. A similar barrel buoy will be placed as near as possible over the remains of the crib at the head of Russell Island, St. Clair river.

Papers were forwarded to the Secretary of War this week by Col. Jared A. Smith, recommending that the Maumee River Bridge Company be allowed to erect a bridge over the river at Toledo. Last Saturday, at the instigation of the bridge people, a public meeting was held in Toledo, which was attended by Col. Smith, the object being to get the sentiment of the public as to whether or not the bridge ought to be allowed. No objection was raised, and after discussing the matter Col. Smith decided to recommend that the bridge be allowed.

Vessel interests in Chicago are endeavoring to secure the construction of two winding basins for large vessels in the south branch of the Chicago river. The first one proposed is at Twenty-fourth street, near South Halstead street bridge, where they plan to dredge out a vacant lot 500 feet wide to make a turning place for 500-ft. ships. Another is planned for the forks of the south branch, near Bridgeport. Major Willard, United States engineer, expresses himself as being in complete sympathy with the idea, and will undoubtedly give it his support.

Lieut. George McLellan and Prof. C. H. Peabody of the board of life appliances, have been at Marquette this week conducting a second series of tests with the gas engine lifeboat. The gas engine was shown to be satisfactory a year ago, and the present tests have been to determine the best model of a boat to use with the engine. The board has not yet taken final action, but Lieut. McLellan says there is no doubt but that the gas engine boat will be adopted. This is considered one of the most important innovations which has recently been offered for introduction in the service.

John W. Collins, chief engineer of the revenue cutter service at Washington, announces that the great lakes will soon have a revenue cutter named Mackinac. The cutter is now being built at the ship yards of the William R. Trigg Ship Building Co. at Richmond, Va. The agitation to name a cutter after the beautiful islands was started at Milwaukee about a year ago and was endorsed by Secretary Long of the navy department and Senator McMillan of Michigan. Several of the Wisconsin congressmen fell into the scheme, and through the aid of all the officials the cutter was named Mackinac.

As a picture nothing excels the colored photograph of the City of Erie, issued by the Cleveland & Buffalo Transit Co. It is about 24 in. wide and 15 in. deep and is most exquisitely printed. The photograph was taken while the vessel was leaving the harbor and the city offers a convenient and picturesque background. There was just sufficient move-

ment to the water at the time to make a slight ripple of blue which contrasts beautifully with the white foam thrown up by the ship as it cuts the water. The ship was flying at the time the national, marine and company flags, all of which are most delicately executed in colors. To repeat, as a marine picture, one could get nothing more satisfying to hang upon the walls of his office.

The new coal dock of the Youghioghny & Lehigh Co., at West Superior, Mich., was tested recently. It has been over a year since the old dock stopped receiving coal, but the new one, or rather the old one rebuilt, now has its first cargo in. The dock has three fine new steel hoisting rigs, with machinery of the latest pattern, which are not duplicated at the head of Lake Superior. These rigs have clamshell buckets with a capacity of about 2,500 pounds of coal each. It will take a couple of days to unload the first vessel, as the machinery works slowly at first, and there are many little corrections to make. The old dock held about 60,000 tons of coal. The new one has much larger floor space, and the height of the rigs makes it possible to store nearly 200,000 tons. The concrete floor is still unfinished, but a crew of men is at work and the dock will be ready for a full supply.

THE JAPANESE NAVY.

Japan now has a total of twenty-eight vessels of war aggregating 203,908 tons displacement, this excluding all small cruisers, gunboats and torpedo craft. The list follows:

Name.	Class.	Displacement.	Speed in knots
Fuji—1st class battleship.....		12,300	18
Yashima—1st class battleship.....		12,300	18
Shikishima—1st class battleship.....		14,850	19
Asahi—1st class battleship.....		15,000	18
Hatsusi—1st class battleship.....		15,000	18
Makasa—1st class battleship.....		15,000	18
Chinyer—2nd class battleship.....		7,220	14
Fuso—3rd class battleship.....		3,718	13
Hiyei—3rd class battleship.....		2,300	13
Kongo—3rd class battleship.....		2,300	13
Heijer—3rd class battleship.....		2,300	13
Tokiwa—1st class armored cruiser.....		9,750	21
Asama—1st class armored cruiser.....		9,750	21
Idzuma—1st class armored cruiser.....		9,750	21
Yakuma—1st class armored cruiser.....		9,436	20
Iwami—1st class armored cruiser.....		9,850	20
Adzuma—1st class armored cruiser.....		9,850	20
Chiyoda—3rd class armored cruiser.....		2,450	19
Chitose—2nd class cruiser.....		4,760	22½
Kasagi—2nd class cruiser.....		4,784	22½
Takasago—2nd class cruiser.....		4,160	22½
Yoshimo—2nd class cruiser.....		4,150	22½
Akitsushima—3rd class cruiser.....		3,100	19
Naniwa—3rd class cruiser.....		3,650	18.7
Takachilo—3rd class cruiser.....		3,650	18.7
Matsushima—3rd class cruiser.....		4,210	16
Itsukushima—3rd class cruiser.....		4,210	16
Hashidate—3rd class cruiser.....		4,210	16

COAL CONSUMPTION OF NICKLAUSSE BOILERS.

The gunboat Decidee on her six-hour final trial at one-third speed showed a consumption of 1,535 lbs. of coal per I.H.P. per hour. On a trial at one-half speed for a period of 24 hours, the consumption was 1,714 lbs., and on her full speed natural-draft trial, six hours duration, the consumption was 1,828 lbs.

The gunboat Zelee showed a consumption of 1,282 lbs. on her six-hour one-third speed trial, 1,611 lbs. on her 24-hour trial for speed test and 1,624 on her six-hour run, full speed, natural draft.

The tug Titan showed the remarkable efficiency of 1,295 lbs. on her full speed natural draft test and 1,486 lbs. for 24 hours under ordinary cruising conditions.

The Nicklausse boiler is to be fitted on one of the large British 22,000 H.P. cruisers, as well as on various smaller vessels of the British navy. It is fitted extensively on board French naval vessels and the Italian armored Garibaldi of 13,500 H.P. and the Russian cruiser Variag of 17,500 H.P. are both fitted with this type of boiler, now undergoing speed tests. The William Cramp & Sons Co. are fitting the boiler on all the large war vessels that have been contracted for by them during the past two years. The Russian cruiser Variag and battleship Retvizan, as well as the United States battleship Maine are being equipped with these steam generators. The monitor Connecticut, building at the Bath Iron Works, is also being fitted with these boilers.

The reason the Hamburg-American liner Deutschland, swiftest of ocean crossers, was more than half a day late on the voyage she finished off Sandy Hook on Sunday night was because one of her starboard pistons became overheated on Wednesday morning, the second day out from Cherbourg. Both the port and starboard engines were shut down for five hours and the ship lay to while the engineers took off the cylinder head and cooled the piston. The ship then resumed her trip, going at half speed with both sets of engines for about 12 hours. She made her usual speed of about 23 knots an hour thereafter. On the nautical day ended at noon on Sunday she covered 572 knots. The temporary derangement of her machinery had not affected her power. Her time was 6 days 7 hours and 7 minutes, and her average speed 20.84 knots, which is pretty good for a disabled ship.

A handsomely fitted steam yacht has just been built by Hiram Weller's Sons, Trenton, N. J., for Mr. S. B. Wetherill, of Philadelphia. The specifications stipulated that the boat should make a speed of 14 knots. She is a twin-screw boat, and the engines were installed by the Reeves Machine Co. of Trenton. On the recent trial trip the yacht is understood to have made a speed of 15.6 knots before her machinery had been properly "shaken down." The result is a high compliment to the engines of the boat. The boiler was furnished by the Almy Water Tube Boiler Co. of Providence, R. I.

ACTIVITY AT NEWPORT NEWS.

(From Newport News Daily Press.)

Newport News is on the eve of what is expected to be the busiest season in its brief but eventful history. Those who have studied the conditions, carefully considering substantial promises of the immediate future, predict that the fall and winter, especially the winter, and the spring will see a resumption of activity in every branch of trade which will eclipse the gratifying conditions of last year when everybody and every trade were as busy as they could be. The prospects at this time are even brighter than they were at the corresponding period last year. There is more to look forward to. There are better evidences of what is coming.

With the certainty of getting more costly ships to build in the next few months, of an enormous increase in the commerce of the port, both in exports and imports, the necessity of employing additional men, not by the hundred, but by the thousand, at the ship yard and the railway terminals and in the smaller industries of which the city boasts—with these assured prospects, Newport News unquestionably is on the eve of a great season, and everybody is ready to meet it.

There is every reason to believe that the mammoth plant of the Newport News Ship Building & Dry Dock Co. has before it the busiest period it has enjoyed since its start in the early 90's, when the first of the famous Morgan line steamships were turned out—splendid advertisements at the time of what the new ship yard could do and what it proposed to do, and in every way as good and staunch today as they were when they made their maiden voyages down the coast from New York to New Orleans, the pride of the American merchant marine. At this time the ship yard is working on contracts that aggregate in value about \$14,000,000. It has just turned out ships whose contract prices aggregated \$8,000,000. There is considerable repair work on hand and more in sight. Before the close of the year the government will open bids for fourteen warships which will cost \$50,000,000—this yard should and expects to get contracts aggregating probably \$15,000,000. Employing now between 5,000 and 6,000 men, the ship yard will have to increase its force largely during the winter, as a number of vessels will be put overboard in quick succession and the need of additional men will be much greater. Work on the new warship contracts which the company expects to get will alone keep an immense force busy for three years to come, to say nothing of the men required to finish up the ships now in various stages of advancement and to handle the steady repair work which this yard enjoys, on account of its advantageous location and unrivaled facilities for turning out quick jobs. The completion of the new \$1,000,000 dry dock, which will be in operation in December, very probably, will make this yard better equipped than any other in the country for handling repair contracts for merchant, as well as naval, vessels, and the two dry docks will be kept busy all the time, necessarily keeping a large number of men employed on repair work alone.

THE HAMILTON AND LAKE ERIE POWER CANAL.

The first sod on the Hamilton & Lake Erie power canal was turned with appropriate ceremonies at Silverdale, near Welland, Ont., on July 18, in the presence of nearly 2,000 people. No time has been lost in starting this work, as the order in council authorizing it was only signed on July 7. Mr. Windell Johnson, Reeve of Gainsboro', introduced Mr. E. A. C. Pew, who is the promoter of the enterprise. Mr. Pew gave an interesting account of the starting of the canal. It became necessary in order to start it to find a market for the power. For this he organized the Canadian Steel Co., with a capital of \$18,000,000, to locate at Welland, and an act of parliament was passed authorizing the steel company to guarantee the bonds of the power canal, and they did so, also contracting for 15,000 electric horse-power, which they get at \$20 per year, a horse-power for 24 hours a day. The map approved by the government shows a canal starting at Welland river and running 6½ miles to the Jordan river, where it runs 6 miles to the Jordan village. A diversion canal will be built by which a fall of 255 ft. will be secured. The canal will be completed about the same time as the steel works, about Sept. 1, 1901, and power will also be transmitted to Toronto and Hamilton at about half the steam rates. Electric power, Mr. Pew claims, can be produced at this point at a lower rate than any other point where electricity is developed, as there are no engineering difficulties to be overcome. The installation plant will develop 25,000 H. P., which will be increased to 50,000 or 60,000 as required. The canal will be 150 ft. wide at the top, 60 at the bottom, 12 ft. deep with a current of 3½ miles an hour. The cost is estimated at about \$1,000,000, and estimates for electrical machinery have already been received from the Stanleys, of Pittsfield, Mass., the Royal Electric Co., Montreal, and others.

A number of other speakers complimented the district upon the bright prospect of power being furnished so cheaply, and the great strides being made by electricity. The water for the power canal comes from Lake Erie, via Niagara river and Welland river, and its success means much to Welland and vicinity, not only as to starting the steel works but other manufactories in the section.—Canadian Manufacturer.

REPAIRS TO THE OREGON.

The Oregon will be fully repaired at the Kure dock yard, and it will take probably four months to put the ship in condition for service. Admiral Remy's recommendation that permanent repairs be made will be carried out. The navy department approved of the suggestion, providing the Japanese government is able and willing to permit us to do the work at Kure. Inquiries have been made in the usual way through the state department. Naval Constructor Ruhm, who is en route to Manila to take the place of Constructor Hobson ordered home, has been intercepted at Yokohama and instructed to proceed to Kure and superintend the work of the ship. There is no doubt that the Japanese government will agree to the project of doing the work on the Oregon at Kure. The officials of that government offered the facilities of the dock promptly at the time of the accident to the Oregon.

Commander C. S. Sperry and Lieut. D. F. Sellers, have been ordered to duty at the navy department. Commander Sperry will be on duty in connection with coaling stations in the bureau of equipment. Lieutenant Sellers will take the place vacated by Lieut. W. W. Phelps in the enlistment branch of the bureau of navigation upon his assignment to duty on the Indiana.

THE SUBMARINE TELEGRAPH SYSTEM OF THE WORLD.

The submarine telegraph systems of the world number over 1,500, with an aggregate length of wire of more than 170,000 miles, or about equal to six times the circumference of the earth. The total cost of maintaining this great enterprise is estimated at \$250,000,000 annually, while the number of messages transmitted beneath the sea is about 6,000,000 per year. In the last fifty years and since the practicability of submarine telegraphy has been demonstrated, electric wires have been laid under every ocean except the Pacific, and there are two lines projected under the latter. More than a score of lines have been laid across the Atlantic and thirteen of them are now in successful operation between the United States and Europe. There are three lines between South America and African and South European coast lines. The Mediterranean sea is crossed and recrossed in its entire length and breadth by numerous cable lines. Lines connect the Far East with Europe and America by way of the Indian ocean, the Red sea and the Mediterranean sea. The Gulf of Mexico and the Caribbean sea is traversed in all directions by lines which bring its islands and colonies into speaking relations with each other and with South America, Central America, the United States, Europe, Africa, and in fact the whole world. Along the eastern coast of Asia cables are laid from port to port and from island to island. South America is skirted with cables along its entire coast except in the extreme southern portion where the communication is by land. There is a cable line from Australia to New Zealand and another from the New Caledonia islands to Australia. The developments in the laying, constructing and operating of submarine cables and their availability for public use have kept pace with their general extension throughout the world. From a mere gutta percha wire the submarine conductor of electricity has developed into a great cable having a central copper core surrounded and covered by many layers of non-conducting material and protected by steel wire wound spirally about it and by water-proof and insect-proof wrappings. The effect of the submarine cables in the transmission of thoughts and words from one end of the world to the other is shown in the rapid development of international commerce since the system was inaugurated. The first successful cable line between the United States and Europe was put into operation in 1866. With a direct cable communication across the Pacific ocean and direct water communication through the Nicaragua canal and an increase in the number and capacity of the American steamships it is not improper nor visionary to suppose that a material addition may be obtained by the United States in the commerce and carrying trade of the world.

TURBINE-PROPELLED CHANNEL STEAMERS.

Owing to the ease with which the most recent of the turbine-propelled vessels can be maneuvered—going backward at a moderately good speed as well as forward, etc.—and to the extreme speed attained on a light draught, it is not improbable that before very long we shall have channel steamers fitted with this type of propelling machinery. Light draught is a determining factor in vessels designed for prompt dispatch at several of the harbors in France, and, of course, the facility with which speed can be got up to its maximum in turbine-propelled vessels, as well as the welcome absence of vibration when such speed is being maintained, are all weighty considerations in this problem of quick and comfortable—if not economical—transport to passengers across channel. The proposal to employ turbine-propelled vessels has been before several of the companies having the working of passenger channel steamers and it is understood that in the case of at least one of these—the London, Brighton and South Coast Railway Co., who conduct the channel service between Newhaven and Dieppe—consideration of the matter has favorably impressed the directors and their advisers. Denny & Brothers, of Dumbarton, who build largely for the company, have had three of their partners on board the Viper on her trials off the Tyne, the performances of the vessel, and of her novel propulsive agents, having been closely observed. While the average of six runs on the mile was, as above stated, 36.58 knots, two of the six runs were accomplished in 1 min. 37 sec., equal to 37.11 knots, or 42¾ miles. The speed which a pioneer turbine-propelled channel steamer might be called upon to do would probably fall far below this remarkable pace, so that even if 28 or 30 knots were provided—with the concomitant of non-vibration—the dreaded channel would be a shorter, if not a pleasanter experience.—Engineering.

FAMOUS OLD WARSHIP CONSTITUTION.

The Massachusetts State Society of the United States Daughters of 1812 has issued a call to all patriotic men and women of the country to unite in raising the money necessary for the rebuilding of the famous old warship Constitution, which is now lying at Charlestown navy yard. The society expects at least \$100,000 will be raised in Massachusetts for the purpose. Kidder, Peabody & Co. of Boston have consented to act as treasurers of the fund. The president of the society, Mrs. Nelson V. Titus of Atlantic, Mass., will give all information necessary for those who intend to subscribe. The famous old frigate has been lying for years at the Portsmouth navy yard, gradually going to decay. At a patriotic meeting held in Faneuil hall on Feb. 22, 1897, Mrs. Titus offered a resolution that steps be taken to have the vessel brought to Boston for the celebration of the one hundredth anniversary of her launching. Secretary of the Navy Long speedily assented, heartily co-operated with the society in a letter to the committee on naval affairs on Dec. 4, 1899, and spoke of the Constitution as a "relic of the glory of our navy in its early days, the memory of whose prowess is still cherished among our people as a gratifying evidence of patriotism that should be encouraged. The restoration of this old man-of-war for the government by voluntary subscription from the people, under the auspices of this society, would be an object lesson of great value to the nation." A bill for this purpose was therefore passed by both houses of congress and approved by President McKinley on Feb. 14.

It has been decided to raise \$100,000 as a memorial to Rear Admiral John W. Philip. Naval Constructor Francis T. Bowles of the Brooklyn navy yard, and Commander D. Delahanty, governor of Sailor's Snug harbor, are in charge of the movement. It is probable that Rear Admiral Albert S. Barker, who succeeded Rear Admiral Philip in charge of the New York navy yard, will be the chairman. Miss Helen Gould will be on the committee.

ATLANTIC AND PACIFIC COASTS.

THE SHIP BUILDERS OF BOTH COASTS ARE EXTREMELY BUSY, THOUGH FEW CONTRACTS ARE REPORTED.

Washburn Bros., Thomaston, Me., are full of business. They have already built two vessels this season and now have the keel laid for a third. The third vessel this year was a four-masted schooner, the John E. Devlin, built for Capt. E. L. Hichborn, of Stockton Springs. The second vessel was a three-master, the Mary E. Lermond, built for Capt. Geo. F. Sproul, of Waldoboro, late of ship Geo. Curtis. This vessel has just sailed on its first trip. The keel has just been laid for another four-master of the following dimensions: Keel 211 ft., beam 42½ ft., depth 20 ft., to be built for Capt. Wm. J. Lermond of Thomaston. All these vessels have oak frames and the ceiling and planking is of southern pine. They are built as well as vessels can be built, for the Washburns pride themselves on the quality of material and the workmanship of all their vessels. This firm employs 100 hands when running at full capacity and pays on the average \$2.75 for ten hours' work. They also keep a force of ten or twelve men making sails and will cut up this year from 50,000 to 60,000 yards of duck. They are having two frames for four-masters cut in Virginia which they will build probably this year. These vessels will be of about 2,000 tons each.

The Samuel H. Ashbridge, which, when completed, will probably be the finest police and fireboat in the world, was launched from Neafie & Levy's ship yard, Philadelphia, last week. Miss Nellie Pierce English was sponsor for the craft. The launch was well attended by city officials, and as the ship yard, by order of President Mathias Seddinger, was thrown open to the general public, there was no lack of spectators. The Samuel H. Ashbridge is 145 ft. long, 24 ft. beam and 12 ft. depth of hold. She is equipped with compound engines and Scotch boilers, and will have cabins aft and below. The contract price was \$82,200. President Mathias Seddinger, of the Neafie & Levy company, said that the builders had voluntarily added 30 per cent. to the strength of the hull over that called for by the specifications. He added that his company felt so much pride in the vessel that they have spared no expense in fitting her up as the finest type of marine architecture for fighting fires on the water.

If anyone desires to see quite an array of dry docks, sections of dry docks and preparations being made to cluster these sections into one big dock, they can be gratified by visiting Tietjen & Lang's ship yard at the foot of 14th street, Hoboken. The fifth section of this concern's big sectional dry dock arrived recently from up the river, and when a little more dredging is done and preparations completed for receiving them they will be coupled together and ready for work in about sixty days, after which Tietjen & Lang will be in the market for vessels for this new dock up to 500 ft. in length. Its lifting capacity is 10,000 tons. This dock has patent adjustable keel blocks, and can take out a vessel drawing 26 ft. of water. This with the other five docks owned by this firm, all within a stone's throw of each other, will make it one of the most convenient and valuable dry dock and ship repair plants in or near New York.

At the ship yard of the James Clark Co., Baltimore, Md., there is a great deal of activity in repair work on vessels. The steamer Richmond, of the Weems Line, is getting a general overhauling of machinery and boilers. The United States lighthouse tender Holly is having a like work performed, while similar repairs to the steamer Maggie, of the Baltimore, Chesapeake & Atlantic Railway Co., have been completed. The steamer Nanticoke, of the same line, is getting needed repairs made to her machinery. A nest of boilers for the Merchants & Miners' Transportation Co.'s steamer Dorchester is being rapidly completed and will soon be in condition for installation. A boiler for the tug Ascher J. Hudson, of Norfolk, is completed and ready for installation, while a new boiler for the tug Sidney is nearing completion.

The Norfolk Shipbuilding & Dry Dock Co. of Norfolk, Va., incorporated some months ago with J. Andre Mottu as president, have decided to locate their plant at Old Fort Norfolk. It will include an 800-ton cradle 150x46 ft., a 600-ton cradle 125x46 ft. for barges; a 2,500-ton cradle 280x76 ft.; back of the cradles will be the railway power house, plate shop 80x50 ft., machine shop 100x50 ft., blacksmith shop 75x30 ft., power house for the entire plant 55x30 ft., and saw mill 150x50 ft. There will be a building slip for 300-foot ships, 90 ft. wide. The company also contemplate at a later date the construction of a dry dock 90 ft. wide. About \$250,000 will be expended in these improvements.

The first six-masted schooner ever constructed will be launched at H. M. Bean's yard at Camden, Me., Aug. 14. The vessel will be named after one of her principal owners, George W. Wells. Capt. Arthur Crowley of Taunton, Mass., will command her. The schooner has 302.11 ft. length of keel, 48.6 ft. beam and 23 ft. depth of hold, with a forefoot poop extending to the forward hatch. She is built of oak and yellow pine. Two anchors, weighing 8,200 and 7,500 lbs. respectively, will be carried, and she will have a 30 H. P. donkey engine and two wrecking pumps, with a capacity of 1,200 gallons a minute.

The dredging at the new property of the Morse Iron Works & Dry Dock Co., foot of 56th street, Brooklyn, is about completed, and the piers will be started next week. The first section of the dry dock will be delivered at 56th street on Sept. 1. Schooner Sadie C. Sumner is discharging timber for the third section at Verplanck, and vessels are on the way south for the balance of the timber. Contracts were placed last week with the General Electric Co., of New York, and the Prindle Engineering Co. for the electric plant and centrifugal pumps for operating these docks.

The new three-masted schooner Commerce was launched last week at Hay & Wright's ship yard, Alameda, Cal. The vessel has a 175 ft. keel, with a beam of 38 ft. 6 in. and depth of 13 ft. 6 in., and was built for Martin Sanders for the coast trade. A duplicate of the Commerce, now building for Sanders at the same place, will be known as the Forester. Hay & Wright are also building a steamer for the Interisland Steam Navigation Co. of Honolulu. Her length will be 172 ft., beam 40 ft. and depth 15 ft., and the launching will take place the last of the year.

The Standard Oil Co. has placed contracts for a yacht to be used in the harbor business at Baltimore. The new craft is to be 60 ft. long and

14 ft. beam, handsomely fitted up with a space for stores. White & Middleton will furnish a 40 H. P. gas engine; Devine & Co. will build the hull, and the joiner work is to be furnished by Otto Duker & Co. When the boat is completed the Petrolia, the present tender, will be transferred to the Norfolk division, to be used in that harbor.

Wellington Greenlaw has been doing some extensive repair work at his ship yard at Calais, Me. The schooner W. H. Card has received new walls, stanchions and decks, and has been thoroughly recalced. The repairs amount to over \$2,000. The schooner Orozimbo is now under repair. She will be received and generally over-hauled to the tune of about \$1,500. Mr. Greenlaw is constantly busy filling orders for yawl boats, pleasure boats and sail boats.

The lighthouse steamer Violet has been laid up for extensive repairs. The contract for the repairs has been awarded to James E. Woodall & Co., Baltimore, Md., who will caulk and remetal her and make some repairs to her joiner work. The James Clark Co. of Baltimore will put in a new hoisting engine, overhaul her engine and boilers. The tug Thistle, also of the lighthouse department, will also be docked at Woodall's yard and remetaled.

There is now under construction at Lewis Nixon's ship yard, Elizabeth, N. J., about 20,000 I. H. P. of water tube boilers of the Mosher type. These boilers are for various naval vessels and the new fast steam yacht Arrow, owned by Chas. R. Flint. They are being built for, or under the direction of the patentee, C. D. Mosher, 1 Broadway.

Keel of a four-masted schooner to be built at Houghton's yard, Bath, Me., for Capt. James Hawley, has been stretched, the stem and stern frame are complete and the staying is up. Some delay has been caused by the non-arrival at the yard of two car loads of frame for the vessel.

The frame of the new three-masted schooner building in the Pendleton & Carter yard at Belfast, Me., for the Pendletons of Islesboro, is more than half up and the vessel is fast assuming her natural shape.

There is much activity about Lewis Nixon's ship yard at Elizabethport, N. J., where 1,000 men are now employed. Twenty-three vessels are on the ways and the machine shops are running night and day.

The first keel plates for the new cruiser Denver were laid last week at the yard of the Neafie & Levy Ship & Engine Building Co., Philadelphia. There were no special ceremonies.

The William R. Trigg Co., Richmond, Va., will bid on the battleship Virginia. The company claim that the battleship can be floated on the James river down to the sea.

The timber for a three-masted schooner, which E. I. White is to build at the William Longfellow ship yard in Machias, Me., is ready for shipment from the Provinces.

A revenue cutter 70 ft. long and of light draught, has just been launched at Lewis Nixon's ship yard, Elizabethport, N. J., for use in Cuban waters.

Steamship S. T. Morgan has been sent to the ship yards of the Harlan & Hollingsworth Co., Wilmington, Del., for a general overhauling.

L. Luckenbach will have another large steel sea-going tug built by John H. Dialogue & Son, Camden, N. J.

AMONG THE LAKE SHIP BUILDERS.

The steamer Louise and tug Dan Conley of Sandusky are at Gilmore's dry dock, Toledo, for slight repairs.

Considerable progress is being made towards the construction of the Collingwood, Ont., ship yards. The masons and bricklayers are at work on the boiler house, machine shop and engine room. The building which is of brick, will be 55x50 ft., one story high. There will be two boilers 6 ft. in diameter and 14 ft. in length, capable of supplying a pressure of 125 lbs. of steam to a tandem compound Corliss engine of 175 H. P. besides a number of smaller engines used in driving the immense rolls in the main building, the steam hammers, shears, hoists, etc. Considerable more machinery, which is being manufactured in Canada, will be placed in the buildings immediately on its arrival, which is expected will be in the course of a few weeks. The large and heavy machinery in the main building has been placed on the cement beds prepared, and the machinists are now busily engaged in placing the pulleys and shafts.

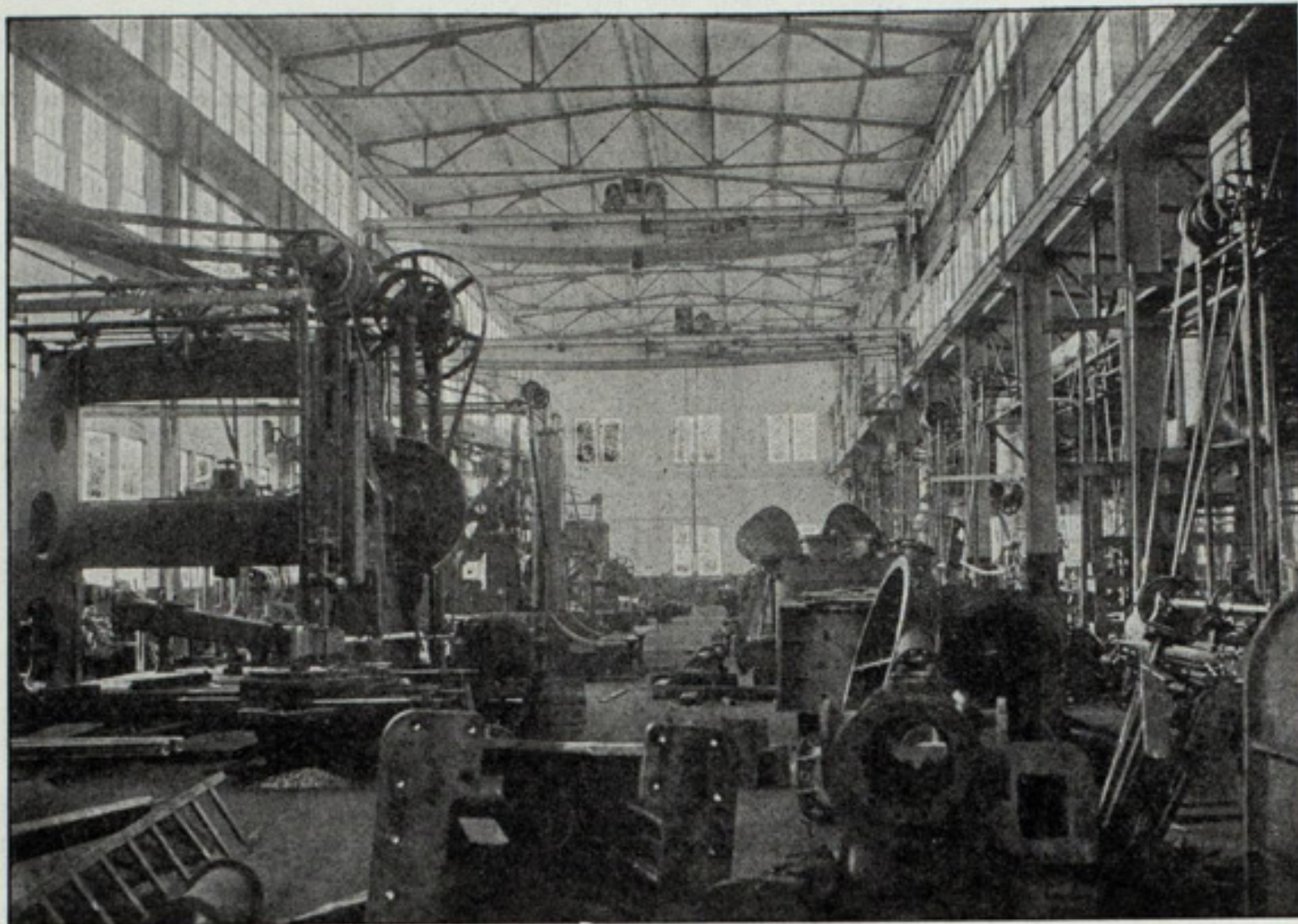
The steel steamer building at the Craig Shipbuilding Co., Toledo, for John L. Crosthwaite, of the Atlantic Steamship Co., will be launched shortly. She is to be called the Waccamaw, after a river in South Carolina that runs through the lumber tract of the Atlantic Coast Lumber Co. The Waccamaw will be ready to go to the coast during the present month, and will soon be bringing yellow pine lumber from the company's mills at Georgetown, S. C., to northern ports. The second steamer of the line, building at Buffalo, will be in the water in September and will get to the coast during the fall. These will be 258 ft. long over all, as large as the locks of the Welland canal will permit, and will develop 1,200 H. P. The name of the Buffalo craft is not settled on yet, though it is likely to be the Georgetown.

The first launching in the stock yard slip, Chicago, occurred last week when Peter Hammler's yacht Jerome was put into her native element at Thirty-ninth and Laurel streets. The boat had been hauled on a flat car from the Hammler boiler works at Thirty-ninth and Halstead streets, where she was built, to the scene of the launching and slid into the stream without a hitch. The christening was done by M. J. Walsh, who broke a bottle of champagne across the bow. A ten-mile spin demonstrated her speed, a gait of 20 miles an hour being struck and after towing a becalmed yacht to the harbor the Jerome was berthed inside the government pier. The boat is named after Mr. Hammler's little son. She is 57 ft. in length and can carry thirty persons comfortably. She was built at the Hammler shops and is a pretty craft. Her engines are on the triple expansion principle.

Rear Admiral Endicott, chief of the bureau of yards and docks, is preparing plans for coaling stations at Portsmouth to accommodate 10,000 tons of coal, at Boston for 15,000, at League Island for 12,000 tons and at Mare Island for 20,000 tons.

THE MICHIPICOTEN IRON ORE BEDS.

Mr. Arthur White of the Grand Trunk Railway returned to Toronto a few days ago from a visit to Michipicoten, Ont., where he had been for the purpose of inspecting the Hellen iron mine. He was conveyed to the mine by Mr. Clergue and had as his fellow traveler Hon. Charles E. Turner, consul-general for the United States, who was taking the trip for the purpose of making a special report to the United States government covering the industries of New Ontario, as now being promoted by Mr. Clergue. When the party reached Michipicoten harbor they found a bustling railway termini, with large trestle works for the unloading of iron



ENGINE MACHINE SHOP AT THE BATH IRON WORKS.

ore, extensive freight yards, locomotive and car sheds, stores, etc., and all the necessary appliances for conducting a heavy freight traffic.

Proceeding by special train to the Hellen mine, a distance of 12 miles, they viewed with astonishment a mountain of almost pure brown hematite ore, which after careful tests by diamond drills is estimated to contain over thirty million tons. The ore is being worked from the face of the mountain, the foot of which is almost on a level with the crusher now being placed in position for the purpose of crushing the ore. The ore is dropped down the face of the mountain with very small blasts, and gravitation does nearly the whole of the business after that through the crusher and down the railway to the trestle works at the harbor, the line being on a grade down of three in 100, with only one exception, where it crosses the Magpie river, when the up grade for a short distance is one in 100. The line is being equipped with 100-ton locomotives, and 50-ton capacity steel cars for the ore. Shipments when begun will be at the rate of 2,500 tons per day. Shipments of ore will be made to Midland, Hamilton and Deseronto, possibly to Montreal, and largely to the United States.

After the company had got through with the testing of the Hellen Mountain mine, water was required in connection with the ore crusher, and they commenced to run a lateral shaft into a mountain, but in place of getting water they were agreeably surprised to find a continuation of brown hematite ore, and up to date they have run two lateral shafts into this second mountain a distance of 250 feet each, finding nothing but a continuation of the best of brown hematite, making it look as if a supply of iron ore had been deposited here specially for the world's use for years to come. The railway is a branch of the Algoma Central, and is intended to connect with the Canadian Pacific Railway at a point near Missanabie, and then eventually to run on to Hudson Bay.

The line from Michipicoten harbor to the Hellen mine is most picturesque, being a continuation of beautiful lakes, having outlets by falls similar to that at Montmorency, Que., and in addition to the beautiful scenery it runs through a virgin country for forest products. The streams are full of trout, catches of fish averaging from twenty to twenty-four inches long being the rule and not the exception. It is the intention to erect a summer hotel during the next winter. Villages have sprung up, principally populated by miners and railway employees, and there are now already permanently settled along the railway between 600 and 700 men, most of them in comfortable residences, and none under canvas, whilst less than a year ago the whole population of the district was represented by two Indian families, who eked out a livelihood in the ordinary Indian fashion.

In connection with the railway, Mr. Clergue has purchased four English steamers having a capacity of 2,500 tons each. These steamers at the present moment are being used for bringing 85-pound rails from Lorain, Ohio, with which to rail the Algoma Central Railway, the latter having under construction their main line from Sault Ste. Marie running north, and another branch from Norton, near Sudbury, tapping the nickel

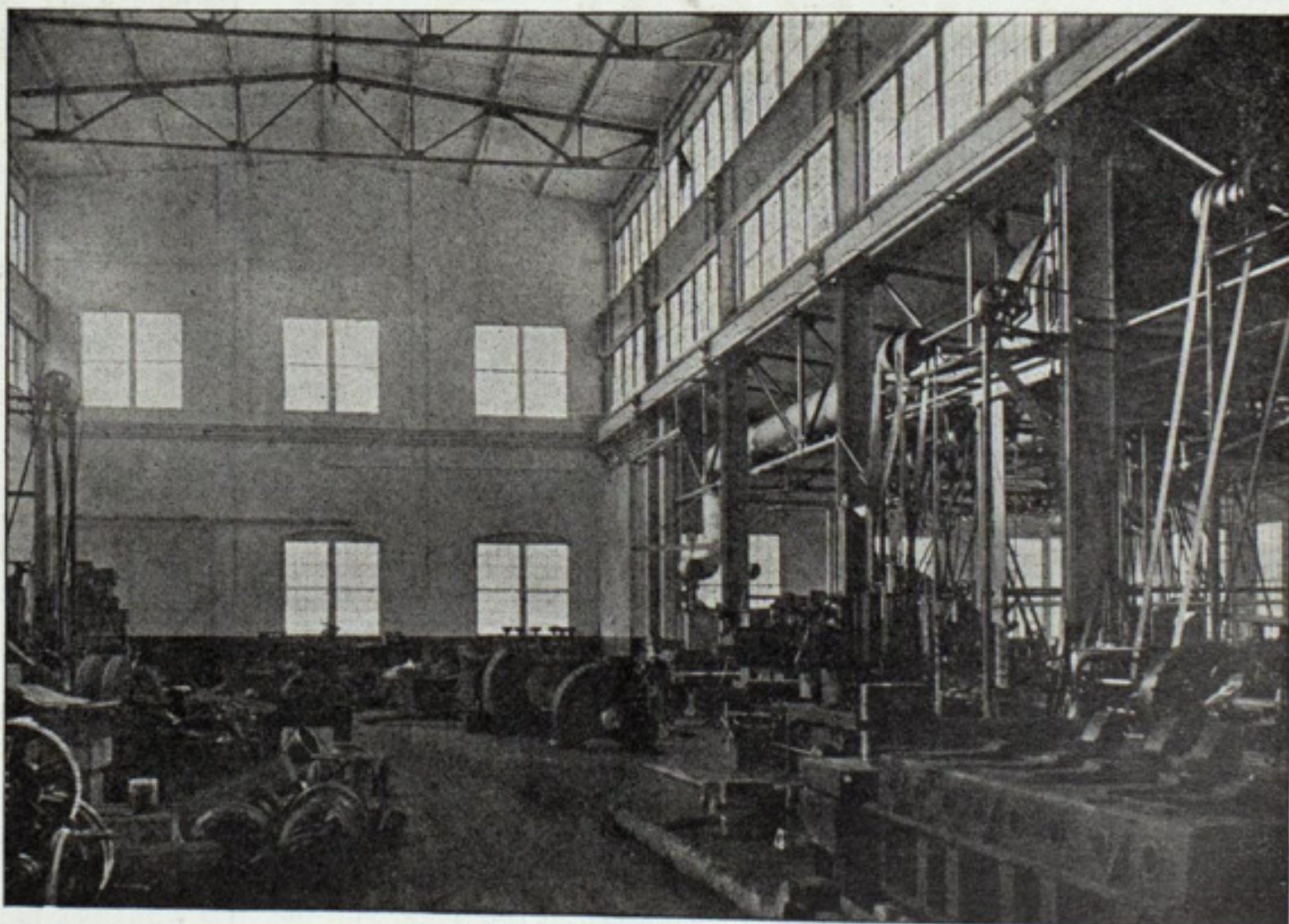
belt owned by Mr. Clergue's companies, which will make a connection in the first place with the Canadian Pacific railway, in order to bring the nickel ore to the Ferro Nickel Works, now being erected at the Sault, and also to the Ferro Nickel Works, now being constructed at Hamilton, Ont.—Canadian Manufacturer.

A 13,000 TON CATTLE STEAMER.

There is nothing in commercial history so remarkable as the growth of the cattle and meat oversea trade. Apart from the import and export of cattle for breeding purposes, the trade is easily within the proverbial memory of "the oldest inhabitant." The great cattle trade steamer *Pontos*, launched on July 12 from the yard of Messrs. J. Priestman & Co., for the Hamburg firm of Messrs. A. C. De Freitas & Co., is the largest vessel of her type and trade ever built. She is intended for the Canadian and Argentine cattle trade. Her principal dimensions are: Length, 445 ft.; breadth, extreme, 54 ft.; depth moulded (shelter deck), 38 ft. 11 in., having a total displacement of over 13,000 tons. This vessel is built to take Lloyd's highest class 100 A1 to the three deck rule, with shelter deck. A cellular double bottom right fore and aft, together with the after peak, provides for about 1,200 tons of water ballast. The hold is divided into water tight compartments by six steel bulkheads. The vessel has three full laid decks, also a long bridge above shelter deck. On the upper and shelter decks there will be accommodation for about 970 head of cattle, with pens for 1,600 sheep above cattle on shelter deck fore and aft.

Electric light will be fitted throughout, also several electrically driven fans, these as auxiliaries to side scuttles and ordinary ventilators, will ensure a most satisfactory system of ventilation to cattle decks. The arrangements for loading and discharging are of a very powerful and complete description, including twelve steam winches, two of which are friction winches for bunkering; three derricks fitted at each main hatch, two at each of the end ones, and four on the bridge deck for working bunker hatches.

A large house is built on fore end of bridge, fitted up for captain, saloon, spare berths, etc.; also houses at sides of engine casing, to provide ample accommodation for officers and engineers. Berths for a crew of 50 and also for 50 cattlemen, are fitted under shelter deck, fore and after ends respectively. The engines and boilers have been built by Messrs. Blair & Co., Stockton. The sizes of the cylinders are: 27 in., 44½ in., and 73 in., with a stroke of 54 in. Steam will be supplied by three large boilers at a pressure of 180 lbs. per square in. Three large donkey boilers of the "Lyne" type, supplied by Messrs. Clarke, Chapman & Co., Gateshead, work the distilling plant and deck machinery. The distillers have a capacity for turning out 60 tons of fresh water every twenty-four hours. The size and equipment of this vessel will make her a decided acquisition to Messrs. A. C. De Freitas's large fleet of steamers engaged in the passenger, cattle, and general trade to the River Platte. The launch was a complete success, and, as the ship left the ways, she was named *Pontos* by Mrs. John Priestman, who received a beautiful bouquet and



ENGINE MACHINE SHOP AT THE BATH IRON WORKS.

a silver present from the owners as a souvenir of the ceremony.—Shipping World, London.

The thirty-fourth annual encampment of the G. A. R. at Chicago. For this occasion the Nickel Plate road will sell tickets at one cent a mile travelled on Aug. 25 to 29, inclusive, good returning until Aug. 31 inclusive, or by deposit until Sept. 30 inclusive, on any one of our peerless trio of daily express trains where scheduled to stop. Write, wire, 'phone or call on nearest agent, C. A. Asterlin, T. P. A., Ft. Wayne, Ind., or E. A. Akers, C. P. & T. A., Cleveland, O. 150, Aug. 29

TRADE NOTES.

A branch office has been opened in Boston by the Magnolia Metal Co. of 266-67 West street, New York.

The American Blower Co. of Detroit, Mich., has issued a revised catalogue dealing with the many forms of blowing apparatus, hot blast systems, kiln arrangements, separators, traps, etc., as well as of steam pumps, governor, and various types of stationary engines which this company extensively manufactures.

The hardware and metal trades of the Pacific coast are in mourning because Frank L. Brown, manager of the sales department of the American Steel & Wire Co. in San Francisco, has resigned and returns to Chicago as general sales agent of the Shelby Steel Tube Co. George H. Isman succeeds Mr. Brown. Business associates presented Mr. Brown with a handsome silver service and gave a banquet in his honor.

Under the title "Revolution in the Art of Tube Making" a handsome booklet has been issued by the Empire Seamless Tube Co., manufacturers of hot-rolled seamless steel tubing, with works at Depew, near Buffalo, and offices at New York, Buffalo and Boston. It is an interesting story that it tells. There is a handsome view given of the celebrated National Tube Works, at McKeesport, Pa., together with excellent portraits of Mr. Chas. H. Twist, designer of machinery and appliances for the manufacture of seamless tubes, Mr. Harvey K. Flagler, master tube works constructor, and the late John James Fisher, of England, expert tube and pipe manufacturer.

The rapid growth of the export business of the B. F. Sturtevant Co. of Boston, Mass., manufacturers of blowers, heating and drying apparatus, engines, forges, electrical equipment, etc., is well exemplified by recent orders for forges which aggregate 200 for Japan, seventy-five for Russia, forty for Germany, thirty-two for Canada and twenty-four for Sweden, in addition to large numbers distributed through its London and continental stores. Domestic demands have likewise increased in the same line during the past few months, large forge equipments having been furnished to several ship-building and locomotive shops in the United States. The manual training, trades and technical schools have also been placing some large orders with this company.

The Chicago Pneumatic Tool Company has engaged Mr. Fred F. Bennett as sales agent and manager of advertising, with headquarters at the main office of the company, Monadnock block, Chicago. Mr. Bennett resigned a position as sales agent for the American Steel Casting Co. and American Coupler Co. of Chester, Pa., the change taking effect July 1. Mr. Bennett seems to be peculiarly adapted to his present position. His apprenticeship of several years was served on the Chicago daily papers as reporter and city editor, and later he was city editor of the Omaha Republican. Subsequent to this he was for many years western representative of the Railroad Gazette of New York. His long experience in the journalistic field, his railroad acquaintance, combined with his thorough knowledge of trade publications, should make him a valuable acquisition to the staff of this company and they are to be congratulated

on securing his services in a department of their work for which he seems peculiarly qualified.

An illustrated catalogue of wood-working machinery, manufactured by the S. A. Woods Machine Co., South Boston, Mass., is just from the press. It is a most voluminous and comprehensive publication of 115 pages. For nearly fifty years this firm has given its undivided attention to the lines of wood-working machinery illustrated in the catalogue.

The firm owns many patents and is constantly adding new ones. The machines of this firm have been represented at nearly all expositions and during the world's fair won twelve prizes on an exhibition of fifteen machines. In designing the machines special care is taken that the material shall be so distributed as to withstand the strains consequent upon high speed and constant hard service. A thorough system of supervision and inspection is established in all departments, care is given to every detail and only the best quality of materials is used. In every instance the machines are put into practical operation and carefully tested before leaving the works. The frames are fitted together with planed surfaces and turned bolts to secure permanent stability. All running parts, bolts, screws, etc., are made to standard sizes and duplicates can be promptly supplied.

Niagara Falls excursion via the Nickel Plate road, Saturday, Aug. 18. Special train leaves Broadway station, Cleveland, at 10:15 p. m. Three dollars round trip. Tickets good returning until the 22d inclusive on any one of our peerless trio of daily express trains where scheduled to stop. For further information, write, wire, 'phone or call city ticket office, 190 Superior street, telephone Main 218, or Euclid avenue station, telephone Doan 817. 166, Aug. 18.

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of August 8, 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire.....	33	33 1/4	33	33 1/2
American Steel & Wire, Pfd.....	.....	.....	.....	.....
Federal Steel	33	33 1/4	32 3/4	33
Federal Steel, Pfd.....	.....	.....	.....	.....
National Steel	24	.....	.....	24
National Steel, Pfd.....	83 1/2	.....	.....	83 1/2
American Tin Plate	23	.....	.....	23
American Tin Plate, Pfd.....	.....	.....	.....	.....
American Steel Hoop.....	19	.....	.....	19
American Steel Hoop, Pfd.....	.....	.....	.....	.....
Republic Iron & Steel	9 1/4	.....	.....	9 1/4
Republic Iron & Steel, Pfd.....	50 1/4	50 3/4	50	50

AMERICAN BRIDGE CO.

DESIGNERS AND BUILDERS OF

Steel Bridges, Steel Buildings

AND

All Classes of Metallic Structures

GENERAL OFFICES:

100 Broadway, NEW YORK.

BRANCH OFFICES:

BOSTON,

PHILADELPHIA,

CHICAGO,

PITTSBURG.

BALTIMORE,

NEW ORLEANS,

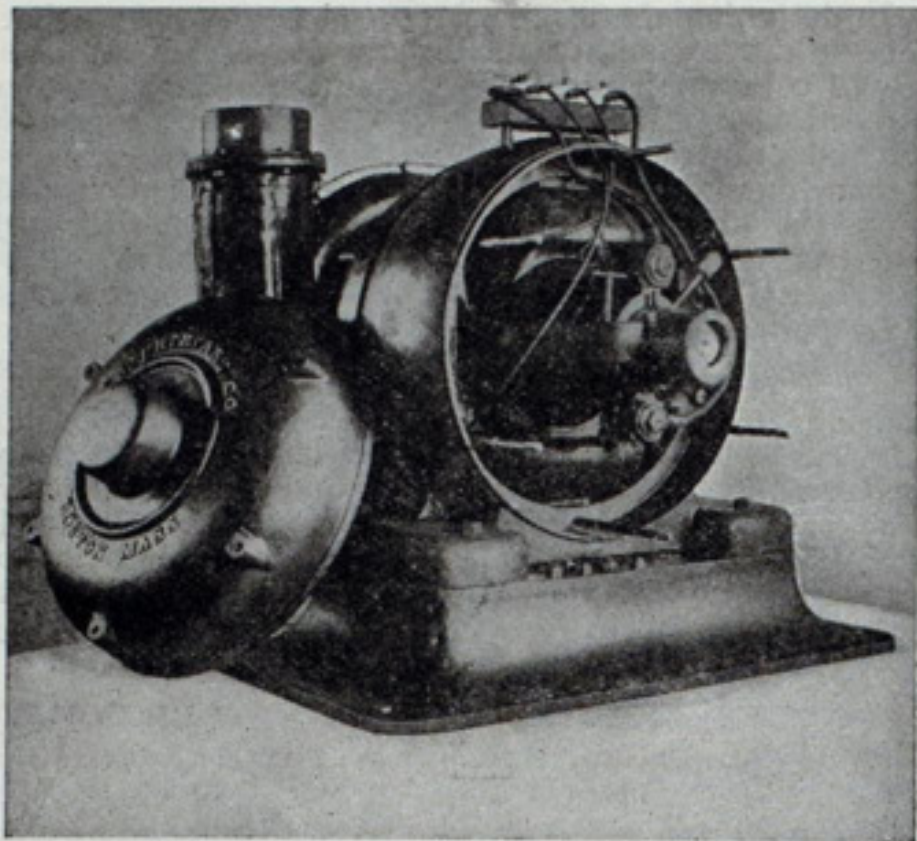
CLEVELAND,

MINNEAPOLIS.

NOVEL TYPE OF ELECTRIC FAN.

In the accompanying illustration is shown an electric fan of recent design manufactured by the B. F. Sturtevant Co. of Boston, Mass. The motor, which is of the bi-polar type, is supported upon a substantial pedestal and carries upon one end the casing of the fan, which is arranged so as to be adjustable about the center of the motor, thus making it possible to discharge air in any given direction.

A single cradle or double yoke carries both bearings, which are of the self-oiling type and self-adjustable. They are thus kept in constant



alignment, and it is possible to remove the cradle and armature together. The armature itself is of the drum-wound type, while the commutator is built up of drop forged copper segments. Self-feeding and self-adjusting carbon brushes with socket holders are employed.

The most important feature of this combination consists in the manner of enclosing the motor so as to keep it free from dust and to make possible the operation of the fan in a dusty atmosphere. The cast iron end of the casing is clearly shown in the illustration, as well as the bolts projecting from the field ring. These bolts pass through corresponding holes in the cover, so that the same may be securely held in place.

The removable cap in the center of the cover makes it simple to reach the bearing and brushes without disturbing the main cover itself.

PROGRESS OF THE BATTLESHIP ILLINOIS.

The new battleship Illinois, building at Newport News yard, will in all probability have her builder's trial about Dec. 1. Fast progress has been made on the vessel in the past few months and it is thought that she will be ready to go on her initial trial, with most, if not all, of her guns aboard in four months. The ship is a sister vessel of the Alabama, building at Cramps, and of the Wisconsin, building at the Union Iron Works, San Francisco. All of the decks of the Illinois except the bridges are finished. The turrets are not yet completed, although the turret-turning gear is finished. The boat cranes are in. The ventilation apparatus has been advanced 90 per cent. and will soon be completed. The drainage system proper is complete. The plumbing and fresh and salt water system are 75 per cent. advanced. One 6-in. gun and two 13-in. guns are ready for installation. The 6-in. gun mounts are finished. The 13-in. gun mounts are in the yard. All of the elevating gear and ammunition hoists for the 13-in. guns have arrived from Washington. The hoists for the 6-in. guns are being built at Newport News and are 75 per cent. completed. All of this machinery will be operated by electricity. The staterooms are being rapidly fitted up and fast work is being made in the storerooms and magazines. The electric lighting plant of the ship has been advanced 40 per cent. The interior communication is about 50 per cent. completed. There will be telephones, speaking tubes and call bells, making a complete system of communication. All of the side belt armor is in place except one plate—the key plate—which is not here. This is the closing-up plate. Eighty per cent. of the casemate armor is on.

PRESIDENT HILL'S ORIENTAL STEAMSHIP LINES.

President J. J. Hill's scheme for a big steamship line to the Orient seems to have taken shape in articles of incorporation filed with the secretary of state of Minnesota this week by the Great Northern Steamship Co. with a capital stock of \$3,000,000. The purpose of the company is stated to be the building and operation of steamships on the high seas and other navigable waters. The incorporators and also the members of the first board of directors are: James J. Hill, D. Miller, W. P. Clough, M. D. Grover and A. W. Clark, all officials of the Great Northern Railroad Co. The officers are not named, but the date of the first annual meeting is fixed for Feb. 1 in St. Paul, which will be the headquarters of the company. The capital stock is divided into 60,000 shares of \$100 each. The filing fee was over \$3,000. The Hill system at present includes the lake steamship line between Buffalo and Duluth and the Trans-Continental railroad. The new company will extend its business to Asia.

Secretary of the Navy John D. Long is at his Hingham, Mass., home on a vacation. In discussing the Chinese situation he said that he did not think that it would be necessary to send more warships or marines to China. There are about 1,000 marines in China now.

BELLEVILLE GENERATORS.

GRAND PRIZE AT THE WORLD'S FAIR OF 1889.

List of Ocean Steamships on Board which BELLEVILLE GENERATORS are Used.

FRENCH NAVY.

Despatch Boat **VOLTIGEUR**; Squadron's Look-out Ship **MILAN**; Squadron's Look-out Ship **HIRONDELLE**; Gunboat **CROCODILE**; Despatch Boat **ACTIF**; Cruiser **AMIRAL RIGAUT DE GENOUILLY**; Iron Clad Cruiser **ALGER**; Iron Clad Cruiser **LATOUCHE-TREVILLE**; Iron Clad Cruiser **CHANZY**; Iron Clad Cruiser **AMIRAL CHARNER**; Tug **ABERYVACH**; Despatch Boat **CAUDAN**; Torpedo Despatch Boat **LEGER**; Torpedo Despatch Boat **LEVRIER**; Battleship **BRENNUS**; Protected Coast Guard **AMIRAL TREHOUART**; Iron Clad Cruiser **BRUIX**; Iron Clad Cruiser **BUGEAUD**; Cruiser **DESCARTES**; Battleship **BOUVET**; Cruiser **POTHUAU**; Cruiser **GALILEE**; Cruiser **PASCAL**; Cruiser **CATINAT**; Battleship **CHARLEMAGNE**; Cruiser **LAVOISIER**; Cruiser **PROTET**; Battleships **GAULOIS**, **SAINT LOUIS** and **HOCHE**; Iron Clad **IENA**; Cruiser **DESAIX**; Iron Clad Cruiser **DUPETIT-THOUARS**; Cruiser **DUPLEIX**; Cruiser **FURIEUX**; Battleship **NEPTUNE**; Battleship **DEVASTATION**; Cruisers **SULLY**, **AMIRAL AUBE** and **MARSEILLAISE**.

COMP. GENERALE TRANSATLANTIQUE: X, steamer of the Tarn class. **MESSAGERIES MARITIMES**: Cargo Steamer **ORTEGAL**; Mail Steamships **SINDH**, **AUSTRALIEN**, **POLYNESIEN**, **ARMAND-BEHIC**, **VILLE-DE-LACIOTAT**, **ERNEST-SIMONS**, **CHILI**, **CORDILLERE**, **LAOS**, **INDUS**, **TONKIN**, **ANNAM**, **ATLANTIQUE**.

COMPAGNIE DES CHEMINS DE FER DE L'OUEST, (Plying between Dieppe and Newhaven): Freight Steamers **ANGERS**, **CAEN**, **BREST**, **CHERBOURG**; Fast Steamers **TAMISE**, **MANCHE**, **FRANCE**.

RUSSIAN NAVY.

Iron Clad Frigate **MININE**; Gunboat **GROZIASTCHY**; Imperial Yacht **MAREVO**; Imperial Yacht **STRELA**; Gunboat **GREMIASCHY**; Gunboat **OTVAJNI**; Imperial Yacht **TZAREWNA**; Imperial Yacht **STANDARD**; Cruiser **ROSSYA**; School Ship **VERNY**; Cruiser **SVETLANA**; Cruiser **DIANA**; Cruiser **PALLADA**; Torpedo Transport Boat **BAKAN**; **KHERSON** and **MOSKBA**, Ships of the Volunteer Fleet; Gunboat **GILACH**; Iron Clad **EKATERINA II**; Gunboat **KOUBANETZ**; Cruiser **AURORA**; Iron Clad **EMPEREUR NICOLAS I**; Iron Clad **PRINCE POTIEMKINE DE TAURIDE**; Cruiser **BAYAN**; Iron Clad **CESAREWITCH**; Gunboats **TERETZ** and **OURALETZ**; Iron Clad **BORODINOW**; **SMOLENSK**, Ship of the Russian volunteer fleet; cruiser **BOJARINE**; Iron Clad **SINOPE**.

ENGLISH NAVY.

Torpedo Boat Destroyer **SHARPSHOOTER**; **POWERFUL** and **TERRIBLE**, iron clad cruisers; **GLADIATOR**, **ARROGANT**, **FURIOUS**, **VINDICTIVE**, cruisers; **NIOBE**, **DIADEM**, **ANDROMEDA**, **EUROPA**, cruisers; **CANOPUS**, **GLORY**, **GOLIATH**, **ALBION**, **OCEAN**, iron clad ships; **ARGONAUT**, **ARIADNE**, **AMPHI-**

TRITE, **SPARTIATE**, **HERMES**, **HIGHFLYER** and **HYACINTH**, cruisers; **VENGEANCE**, iron clad; **ALBERT AND VICTORIA**, royal yacht; **CONDOR** and **ROSARIO**, sloops; **CRESSY**, **ABOUKIR**, **SUTLEY** and **HOGUE**, cruisers; **IMPLACABLE**, **FORMIDABLE** and **IRRESISTIBLE**, **VENERABLE**, **LONDON**, **BULWARK**, iron clad ships; **EURYALUS**, **BACCHANTE**, cruisers; **MUTINE**, **RINALDO**, **SHEARWATER**, sloops; **CORNWALLIS**, **DUNCAN**, **EXMOUTH**, **RUSSEL**, iron clad ships; **DRAKE**, **KING ALFRED**, **LEVIATHAN**, **AFRICA**, cruisers; **VESTAL**, sloop; **MONMOUTH**, cruiser; **BEDFORD**, cruiser; **ESSEX**, **KENT**, cruisers; **ALBEMARLE**, **MONTAGU**, battleships.

The total horse power of boilers fitted on board the 57 above named ships of the British navy is nearly 900,000.

AUSTRIAN NAVY.

BUDA-PEST, iron clad coast guard; **KAISER KARL VI**, cruiser, X', X'', battleships.

ITALIAN NAVY.

VARESE, cruiser; **BENEDETTO BRIN**, battleship.

ARGENTINE REPUBLIC.

PUEYRREDON, cruiser; Steamships **PUERTO-HUERGO** and **MENDOZA**.

SPANISH NAVY.

REINA REGENTE, cruiser.

CHILIAN NAVY.

O'HIGGINS, cruiser; **ALMIRANTE LYNCH**, torpedo boat destroyer; **ALMIRANTE CONDELL**, torpedo boat destroyer; **JENERAL BAQUEDANO**, school ship.

JAPANESE NAVY.

SHIKISHIMA, iron clad; **CHIYODA**, cruiser; **ASAHI**, iron clad; **IWATE**, cruiser; **AZUMA**, cruiser; **HATSUSE**, iron clad; **ITSUKUSHIMA**, iron clad coast guard; **MIKASA**, battleship; **IZUMO**, cruiser.

UNITED STATES OF AMERICA.

Northern Steamship Co.'s Passenger Steamers **NORTH WEST** and **NORTH LAND**, of 7,000 H. P. each; yachts **SHEARWATER**, **CORYELL**, **WILD DUCK**, **SULTANA**.

Cable Address: **BELLEVILLE SAINT-DENIS-SUR-SEINE**.

General Information Sent on Demand.

SAVING BIG WRECKS.

"Do you consider the operation of raising the Saale, Main and Bremen an extraordinary wrecking job?" was asked the president of a great marine underwriting company recently.

"Not in the least," was the prompt answer. "The ordinary floating of a ship means nothing to the wrecking companies these days. When the St. Paul was hauled off the beach at Long Branch it was believed by some to be a most remarkable feat of marine engineering. It certainly was the first instance of a leviathan being saved on this side; but salving of that kind is nothing in England. When the wreckers have simply to get hauling lines out and pull away to float a craft it is no more remarkable than an ant dragging a crumb. It is a serious question of power alone.

"In the case of the Saale and her two sisters, the stopping up of all holes, the use of pontoons and immense cables and the application of pumps capable of discharging 3,600 tons of water per hour, comprise the operation under which the wreckers work. It is only when the wreckers have to build artificial canals, blow up rocks with dynamite, invent new means of suction and buoyancy, that wrecking jobs become remarkable in these days."

One of the most successful wrecking operations of recent years was done by amateurs when the British warship Bonadventure, attached to the China station, struck on the rocks last year; also, when the Oregon recently stranded. The pumps could not make any impression on the water in the lower holds. The captain had a hole cut in the armored deck. From this jet of water nine feet high came out. A screw-nozzle was fitted to the hole and an effort was made to force in air with the diving pump, which theoretically should have been able to do it, but would not. The chief engineer then proposed putting in torpedo air service. With this it would have been possible to blow the ship up, so a safety valve made of a piece of India rubber tubing, which would burst if the pressure rose too high, was fitted to the pipe.

In this way the water was forced out through the two holes it came in at, and the air bubbling out showed the divers where the holes were under the damaged sheathing. The ship was saved in this way.

A famous wrecking job was that which attended the stranding of the steamer Iowa off Cherbourg. She was bound to this city with 350 passengers. Shortly after stranding she careened and seemed to be lost altogether. A London salvage company sent out an expedition and borrowed various appliances from the French government dock yard at Cherbourg. The first thing to be done was to raise the ship in an upright position. A number of steel posts or masts were rigged up vertically, and at the top of each was a block and the fall. The latter were attached to the masts of the fallen craft, but the ship could not be bulged. Three months later the wreckers increased their power and gear, and after pumping the vessel out and making her airtight she practically lifted herself to an even keel with the rising tide. The attempt that failed cost \$20,000, and the second and successful attempt only \$15,000.

Another extensive wrecking job was that of the Wick Bay, a British steamer, which lay in thirty feet of mud near Kings Lynn for four years, baffling all attempts to remove her. When, at last she was raised 3,280 tons of mud were discharged from her with pumps, the divers manipulating the suction pipes inside the vessel.

The salving of the Markomannia, of the Hamburg-American line, which stranded at Savanilla, United States of Colombia, was another gigantic task, and was performed by an American wrecking company. The vessel was tightly wedged in a valley of a coral reefs, which the wreckers had to destroy for a whole mile before they managed to get the vessel off.

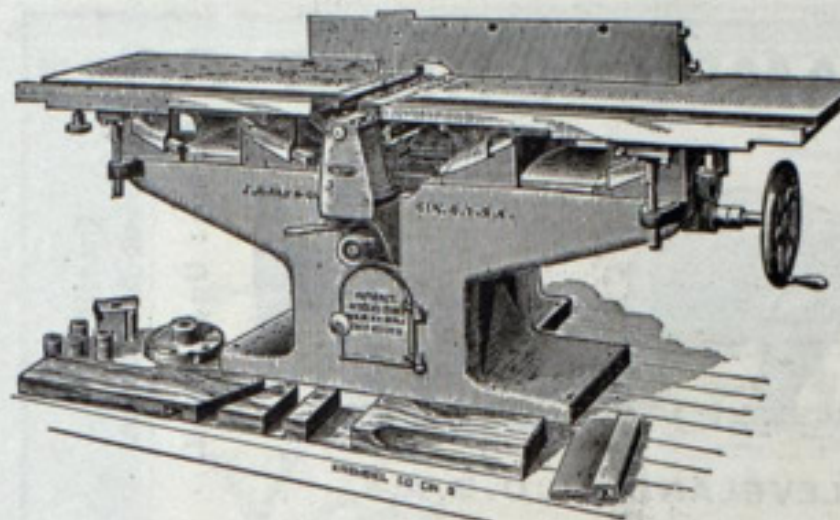
The case of L'Amérique, one of the many French line ships that have met disaster, is another instance of perseverance and ingenuity on the part of the salvage companies. This vessel went ashore at Long Branch, and it took nine months to float her. She ran so high on the beach that the wreckers had to build a canal $\frac{1}{4}$ of a mile long to get her afloat. The Nerito, which stranded on Sable Island; the Elder, which went ashore at the Needles; the Atlas and Wells City, which sunk in the North river, and the Austrian Prince, which stranded at Curacoa, were also subjects of famous wrecking operations. In the floating of the Atlas sixteen chains of $2\frac{1}{2}$ in. were used with eight pontoons and immense pumps.

"It is very rare indeed," said the marine underwriter to whose attention these cases of salving were recalled, "that a big ship cannot be saved."

"A MANUAL OF NAVAL ARCHITECTURE," by Sir Wm. H. White, director of naval construction in England, is one of the best-known books of its kind in the world. A fifth edition, revised and largely rewritten, is just out. It is a text book for students of naval architecture. Price \$9. The Marine Review Publishing Co., Perry-Payne building, Cleveland.

NEW No. 4 VARIETY WOODWORKER.

For the benefit of readers in railroad and ship building lines, we illustrate a machine recently placed on the market by the J. A. Fay & Egan Co. of 325 to 345 West Front street, Cincinnati. It is the Fay No. 4 large patent variety woodworker. This machine, which was specially



designed to meet the requirements of railroad car and repair shops, ship builders, bridge builders, wagon manufacturers, etc., is capable of doing very heavy work, as well as the lightest, to a surprising degree of perfection. It will plane out of wind, surface straight or tapering, rabbet, joint, bevel, gain, chamfer, plow, groove, square-

up, raise panels, rip, cross-cut and tenon; and being fitted with a boring attachment at the back can be used for all sorts of boring and routing.

The tables, which are of iron, planed perfectly true, are of ample size, and can be adjusted independently or simultaneously, and for the purpose of affording access to the cutters can be separated a distance of 15 in. The adjustable fence and bevel rest is always carried with the tables and requires no separate adjustment. It can be moved across the table or set at different angles for beading, cornering or angle planing. The manufacturers, who have a world-wide reputation for turning out high grade woodworking machinery, will be pleased to furnish our readers with prices and full particulars of this or any other machinery, and will also forward their large new illustrated catalogue by express prepaid to manufacturers and foremen.

Under orders from Secretary Long, the monitor being constructed at the Bath Iron Works, recently named the Connecticut, will hereafter be designated officially as "Monitor No. 8," and the name Connecticut will not be applied to her. It is understood that this is the result of protests made against applying the state name to a monitor. In deference to these views, which have been somewhat vehemently expressed by Connecticut people, the navy department will return the numerical designation of the vessel.



THE KENNEY SYSTEM.

[Patented.]

FOR FLUSHING WATER-CLOSETS.

The best system ever invented for use on steam vessels. No Cup Leathers or Springs.

Owners and Constructors of Steamships, Yachts and Steamboats have found it indispensable.

Used by the U. S. War and Navy Departments—Transport Grant, Sheridan, Burnside, Terry, Logan, Hooker, Thomas, Sherman and others. Also Albany Day Line Steamers, Norfolk & Washington S. S. Line, Steam Yachts Neaira, Aphrodite and Loando, and new Lake Steamers Illinois, Pennsylvania, Angeline, etc.



Showing application of Flushometer.

Send for Catalogue.

THE KENNEY CO., 72-74 Trinity Place, NEW YORK.

BIDS FOR A PATROL BOAT.

The Ohio Fish and Game Commission will receive bids for the construction of a patrol boat for Lake Erie.

Plans and specifications may be had on application to the Secretary of above Commission, Athens, Ohio.

Sealed bids will be received up to 12 o'clock noon, Chittenden Hotel, Columbus, Ohio, Sept. 4th, 1900.

All bids should be mailed to the Secretary Ohio Fish and Game Commission, Chittenden Hotel, Columbus, and any other correspondence to same address, Athens, Ohio.

The Commission reserves the right to reject any or all bids. Aug. 9

Blue Book of American Shipping.

1900 EDITION
JUST ISSUED.

STANDARD MARINE AND NAVAL DIRECTORY OF THE UNITED STATES.

ONLY PUBLICATION OF ITS KIND IN AMERICA.

Particulars of all vessels of the United States and Canada with names and addresses of owners.

A directory of steamship lines with names of purchasing agents and chief engineers.

Contains in 500 pages information on shipping subjects collected in the office of the Marine Review during ten years past.

Lists of ship and engine builders, dry docks, naval architects, marine engineers, ship masters, dredging concerns, iron mining companies, etc.

ONLY RELIABLE COMPILATION OF SHIPPING STATISTICS.

BEAUTIFULLY ILLUSTRATED AND SPLENDIDLY PRINTED THROUGHOUT.

1900 EDITION REVISED, ENLARGED AND IMPROVED.

PRICE, \$5.00.

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CAPT. GEO. A. SIMPSON, Expert Compass Adjuster,
19 YEARS EXPERIENCE.
Yearly Contracts Solicited. Nautical Instruments Repaired.
OLD 'PHONE No 319. SAULT STE. MARIE, MICH.

THE CHAMPION RIVET CO.

Government Work
a Specialty.

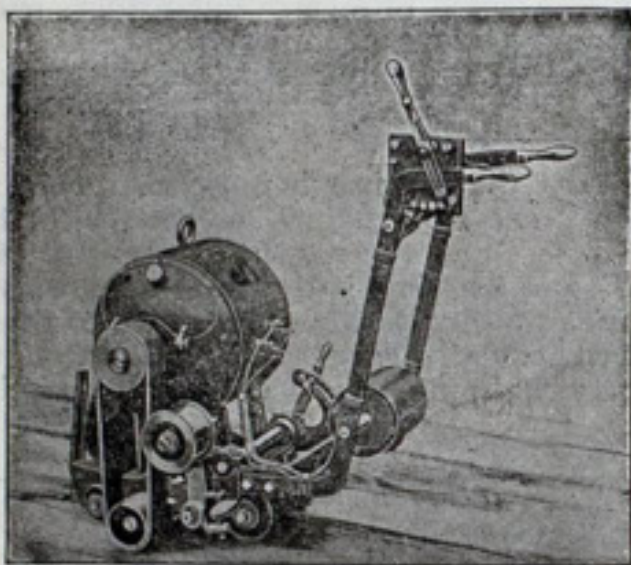


Quality:
Highest Standard.
Finish: Unexcelled.

CLEVELAND, O., U. S. A.

VICTOR BOILER AND STRUCTURAL RIVETS.

PORTABLE ELECTRIC DECK PLANER.



Will do the work of ten
men and do it better.

Depth of cut can be in-
stantly changed.

Motor is dust and
water proof.

For particulars, address

Thomas H. Dallett & Co., 2300 W. York Street,
PHILADELPHIA, PA.

The Bessemer Steamship Company

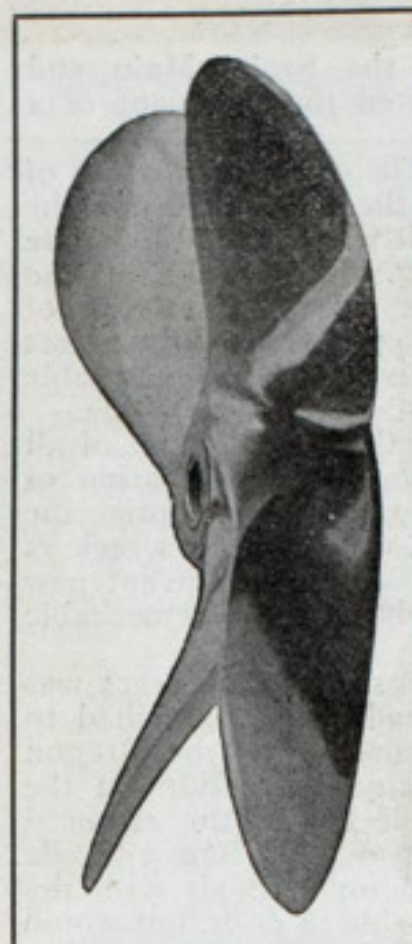
Solicits Catalogues, Prices and Discounts from manufacturers and wholesale dealers in Ship Machinery, Brass Goods, Rope, Paints, Asbestos, Packing, Hose, Furniture, Piping, Glass and Crockery, Tinware, Ranges, Carpeting, Bedding, Life-preservers, Rafts and Boats, Engineers' Supplies and Tools, Carpenters' Tools, Electric Supplies, Lamps, Grate Bars, Castings, etc., etc., etc.

ALSO QUOTATIONS from Market men and Grocers on the Lakes for Provisions and Meat, best quality only.

CATALOGUES without quotations are not wanted.

ALL GOODS except provisions to be delivered in Cleveland.

Address L. M. BOWERS, General Manager,
CLEVELAND, OHIO.



West Superior, Wis., Oct. 25, 1899.
A. Wells Case & Son,
Highland Park, Conn.—
Gentlemen: Your favor of the 16th inst. duly received. As I have stated before, the 32-inch wheel you sent me early this season has given entire satisfaction. We are able to turn up with it nearly as many turns as we did with the 28-inch wheel and get about a mile an hour more speed out of it. I could only confirm other testimonials you have to the effect that your wheel is the most satisfactory I have ever had any experience with. It may be that I shall build a larger boat during the winter, and if so will certainly call upon you for a wheel for it.

Yours very truly,
ROBERT KELLY.

Greenport, N. Y.

Messrs. A. Wells Case & Son,
Highland Park, Conn.—

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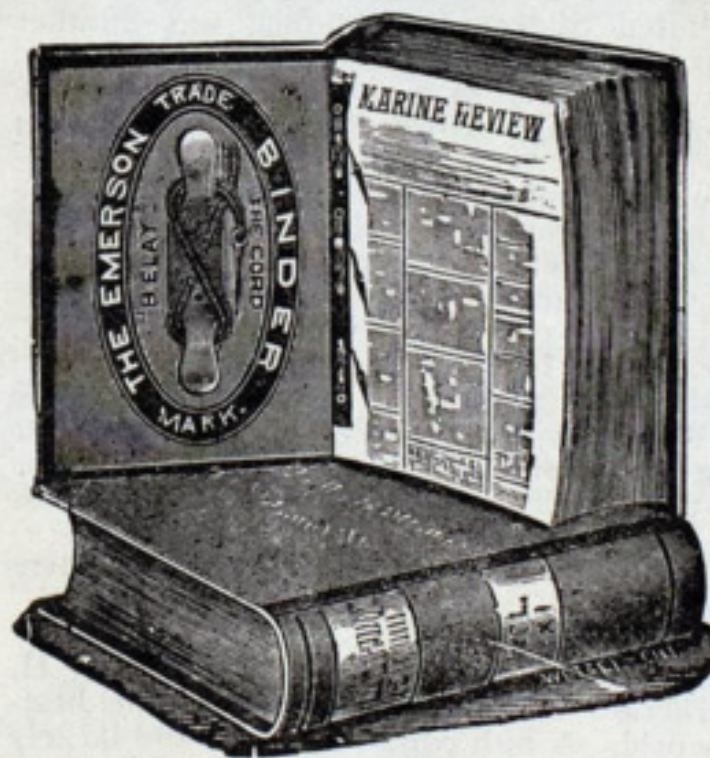
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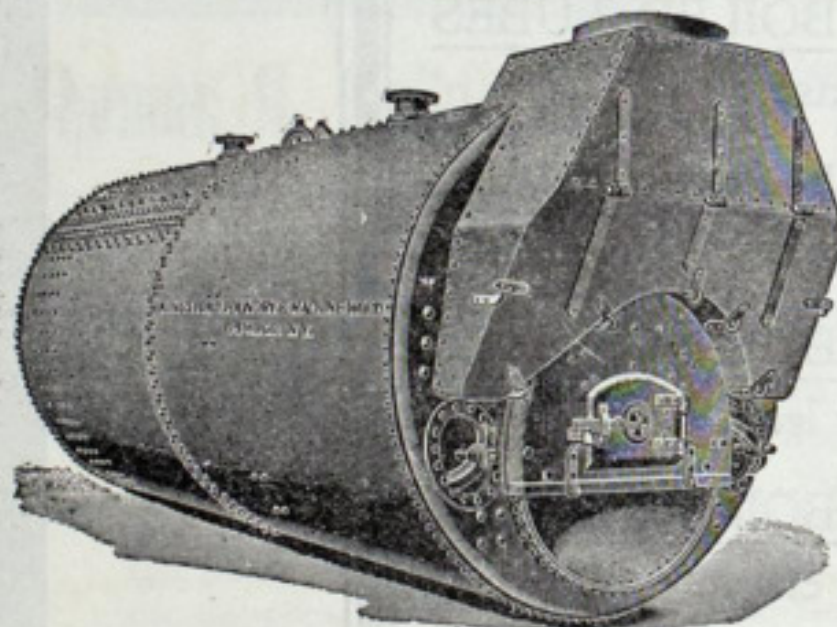
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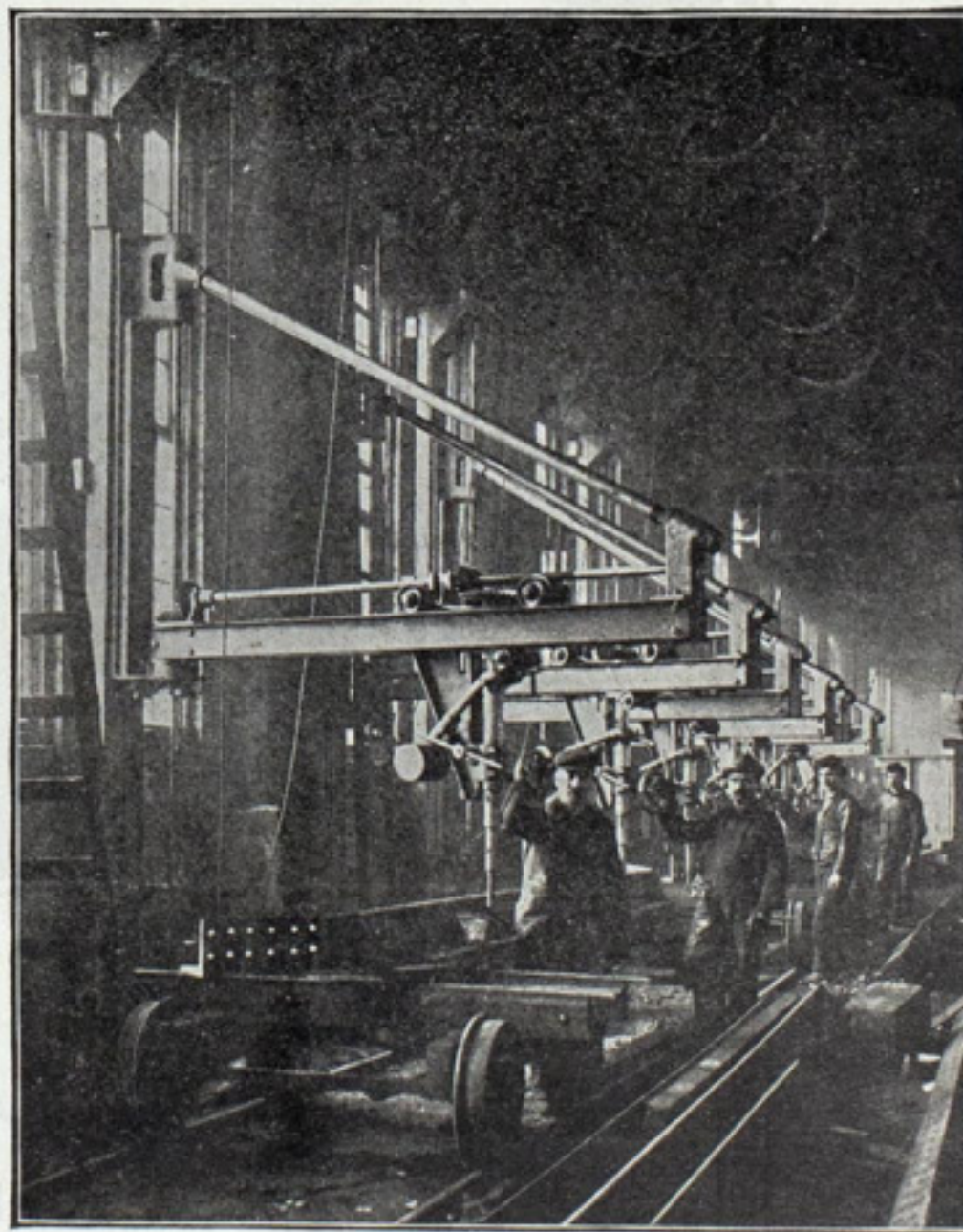


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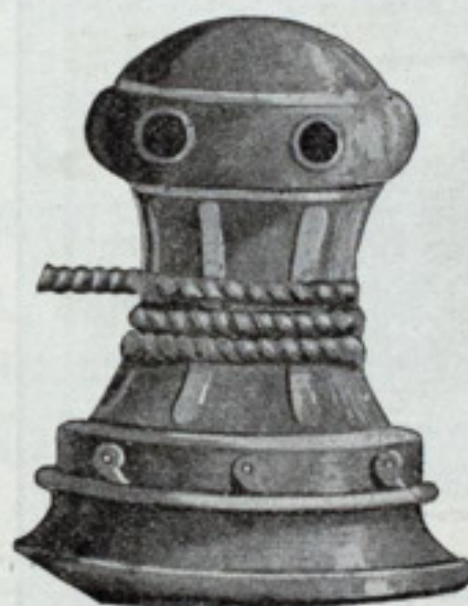
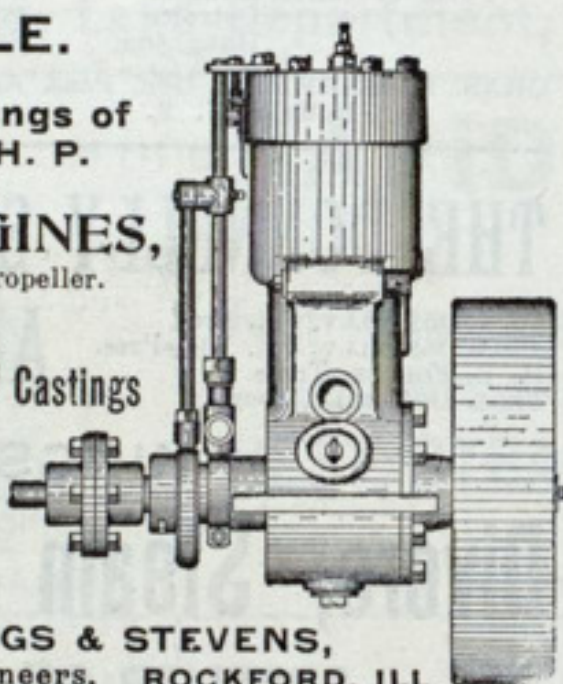
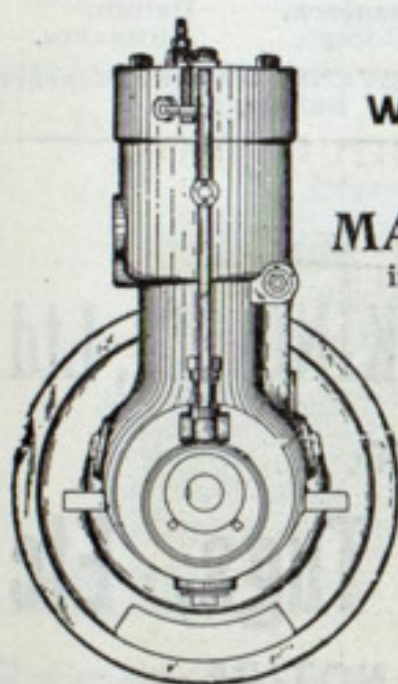
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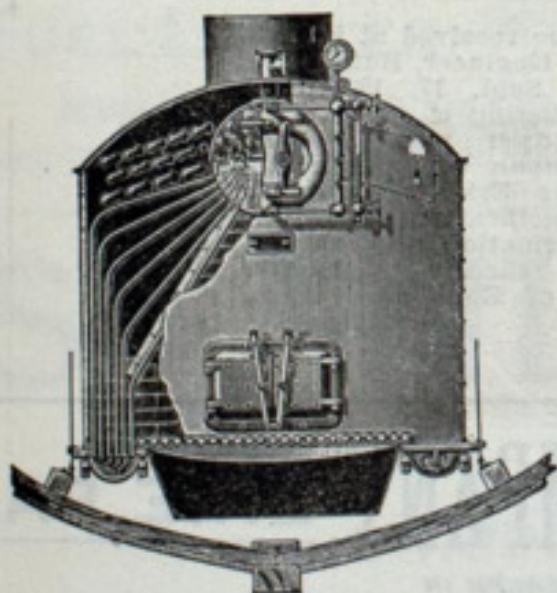
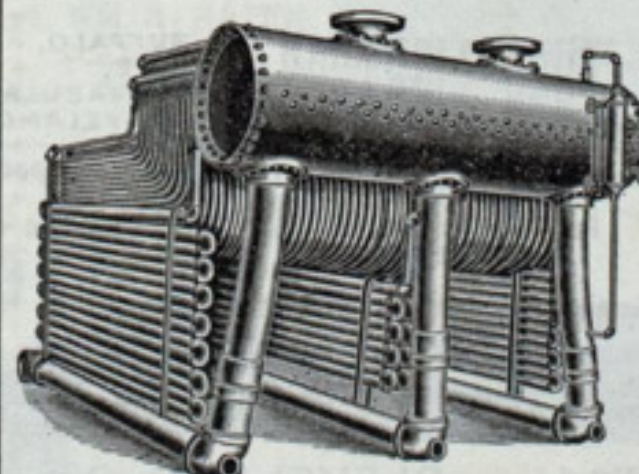
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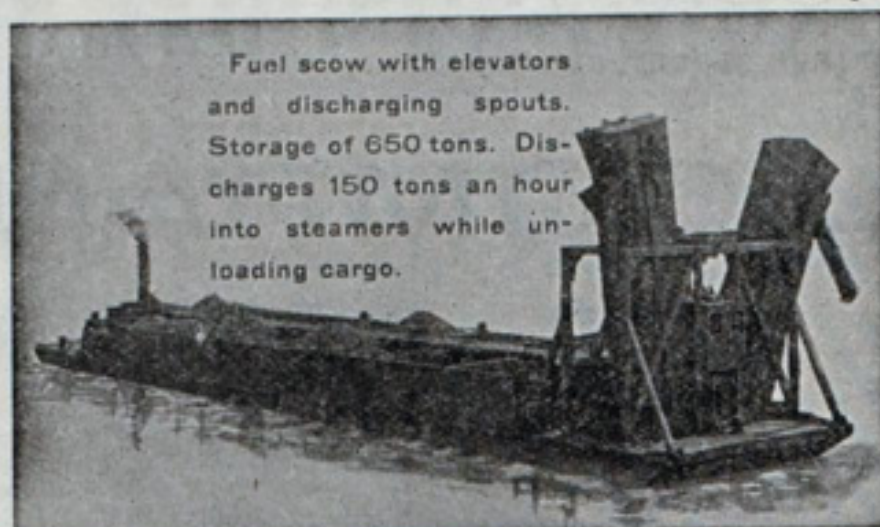
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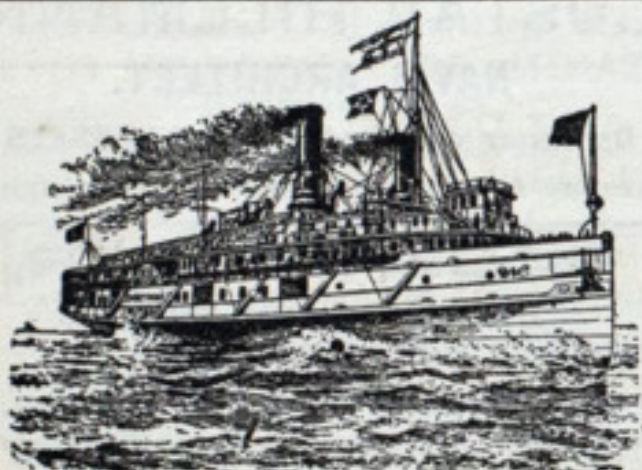
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GAGES, STEAM AND VACUUM.

American Steam Gauge Co.....Boston.

Ashton Valve Co.....Boston.

Crosby Steam Gage & Valve Co.....Boston.

GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.

HAMMERS, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.

Philadelphia Pneumatic Tool Co.....Philadelphia.

Standard Pneumatic Tool Co.....Chicago.

HAMMERS, POWER DROP.

Chase Machine Co.....Cleveland.

Niles Tool Works Co.....Hamilton, O.

HAWSERS, WIRE.

American Steel & Wire Co.....Chicago.

HEATING APPARATUS.

Sturtevant Co., B. F.....Boston.

HOISTS FOR CARGO, ETC.

American Ship Building Co.....Cleveland.

Brown Hoisting & Conveying Mach. Co.....Cleveland.

Chase Machine Co.....Cleveland.

Elwell-Parker Electric Co.....Cleveland.

General Electric Co.....New York.

Hodge, S. F. & Co.....Detroit.

Hyde Windlass Co.....Bath, Me.

Lidgerwood Mfg. Co.....New York.

McMyler Mfg. Co.....Cleveland.

Marine Iron Co.....Bay City.

Sprague Electric Co.....New York.

Westinghouse Electric & Mfg. Co.....Pittsburg.

INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co.....Boston.

Ashton Valve Co.....Boston.

Crosby Steam Gage & Valve Co.....Boston.

INJECTORS.

Jenkins Bros.....New York.

Penberthy Injector Co.....Detroit.

INSURANCE, MARINE.

Brown & Co.....Buffalo.

Drake & Maytham.....Buffalo.

Elphicke, C. W. & Co.....Chicago.

Gibbs & Joys.....Milwaukee.

Hawgood & Moore.....Cleveland.

Helm, D. T. & Co.....Duluth, Minn.

Hutchinson & Co.....Cleveland.

Kelth, J. G. & Co.....Chicago.

La Salle & Co.....Duluth.

Mitchell & Co.....Cleveland.

Osborn & Co., F. H.....Chicago.

Pauly, H. J.....Milwaukee.

Parker, A. A. & W. B.....Detroit.

Peck, Chas. E. & W. F.....New York and Chicago.

Richardson, W. C.....Cleveland.

IRON ORE AND PIG IRON.

Bourne-Fuller Co.....Cleveland.

Hanna, M. A. & Co.....Cleveland.

Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.

Niles Tool Works Co.....Hamilton, O.

LAUNCHES—NAPHTHA, ELECTRIC.

Electric Boat Co.....New York.

Gas Engine & Power Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.

Armstrong Cork Co.....Pittsburg.

Drein, Thos. & Son.....Wilmington, Del.

Kahnweiler's Sons, D.....New York.

Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.

Page Bros. & Co.....Boston.

LUBRICATING PUMPS.

Phenix Metallic Packing Co.....Chicago.

Sterling Lubricator Co.....Rochester, N. Y.

MACHINE TOOLS.

Niles Tool Works Co.....Hamilton, O.

Pelton Engineering Co.....Cleveland.

MACHINE TOOLS (WOOD WORKING).

Fay & Egan Co., J. A.....Cincinnati, O.

Woods Machine Co., S. A.....So. Boston.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W.....New York.

METALLIC PACKING.

Katzenstein, L. & Co.....New York.

Phenix Metallic Packing Co.....Chicago.

U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.

Cramp, Wm. & Sons.....Philadelphia.

Magnolia Metal Co.....New York.

Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

METAL POLISH.

Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.

Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.

Bliss, John & Co.....New York.

Ritchie & Sons, E. S.....Brookline, Mass.

NAVAL ARCHITECTS.

Curr, Robert.....Cleveland.

Hillman, Gustav.....Brooklyn.

See, Horace.....New York.

Wood, W. J.....Chicago.

NICKEL STEEL FORGINGS.

Bethlehem Steel Co.....So. Bethlehem, Pa.

OAKUM.

Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.

Dixon Crucible Co., Jos.....Jersey City, N. J.

Standard Oil Co.....Cleveland.

PACKING.

Jenkins Bros.....New York.

Katzenstein, L. & Co.....New York.

Phenix Metallic Packing Co.....Chicago.

U. S. Metallic Packing Co.....Philadelphia.

PAINTS.

Baker, Howard H. & Co.....Buffalo.

Smith, Edward & Co.....New York.

Upson-Walton Co.....Cleveland.

PAINTING MACHINES, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.

PATENT ATTORNEYS.

Thurston & Baes.....Cleveland.

PATTERN SHOP MACHINERY.

Fay & Egan Co., J. A.....Cincinnati, O.

Woods Machine Co., S. A.....So. Boston.

PIPE, WROUGHT IRON.

Bourne-Fuller Co.....Cleveland.

PLANERS OF ALL KINDS.

Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.

Fay & Egan Co., J. A.....Cincinnati, O.

Woods Machine Co., S. A.....So. Boston.

PLUMBING, MARINE.

Ellis Marine Plumbing Co.....New York.

Mott Iron Works, J. L.....New York.

Sands, Alfred B. & Son.....New York.

Kenney, The Co.....New York.

PNEUMATIC TOOLS.

Chicago Pneumatic Tool Co.....Chicago.

Philadelphia Pneumatic Tool Co.....Philadelphia.

Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.

Bertram's Oil Polish Co.....Boston, Mass.

PROPELLER WHEELS.

American Ship Building Co.....Cleveland.

Atlantic Works.....East Boston, Mass.

Bath Iron Works Ltd.....Bath, Me.

Case, A. Wells & Son.....Highland Park, Conn.

Cramp, Wm. & Sons.....Philadelphia.

Detroit Shipbuilding Co.....Detroit.

Farrar & Trefts.....Buffalo.

Fore River Engine Co.....Weymouth, Mass.

Hardy, John B.....Tacoma, Wash.

Hyde Windlass Co.....Bath, Me.

Harlan & Hollingsworth Co.....Wilmington, Del.

Hodge, S. F. & Co.....Detroit.

Jenks Ship Building Co.....Port Huron, Mich.

MacKinnon Mfg Co.....Bay City, Mich.

Maryland Steel Co.....Sparrow's Point, Md.

Moran Bros. Co.....Seattle, Wash.

Morse Iron Works & Dry Dock Co.....Brooklyn.

Neafie & Levy Ship & Eng. Bldg. Co.....Philadelphia.

Newport News Ship Bldg. Co.....Newport News, Va.

Nixon, Lewis.....Elizabeth, N. J.

Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

Pusey & Jones Co.....Wilmington, Del.

Risdon Iron Works.....San Francisco.

Sheriffs Mfg. Co.....Milwaukee.

Trigg, Wm. R. Co.....Richmond, Va.

Trout, H. G.....Buffalo.

Union Iron Works.....San Francisco.

Wolff & Zwicker Iron Works.....Portland, Ore.

PROJECTORS, ELECTRIC.

Elwell-Parker Electric Co.....Cleveland.

General Electric Co.....Schenectady, N. Y.

Rushmore Dynamo Works.....Jersey City, N. J.

Sprague Electric Co.....New York.

Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F. Mfg. Co.....New York.

Davidson, M. T.....Brooklyn, N. Y.

Kingsford Foundry & Machine Works.....

Van Duzen, The E. W. Co.....Oswego, N. Y.

Worthington, Henry R.....Cincinnati.

New York.

PUNCHES, RIVETERS, SHEARS.

Cleveland Punch & Shear Works Co.....Cleveland.

New Doty Mfg. Co.....Janesville, Wis.

Niles Tool Works Co.....Hamilton, O.

Wood & Co., R. D.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.

Standard Aut. Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.

Bourne-Fuller Co.....Cleveland.

Champion Rivet Co.....Cleveland.

RIGGING ROPE (WIRE).

American Steel & Wire Co.....Chicago.

RUBBER INSULATED WIRES.

Roebbing's Sons, John A.....New York and Cleveland.

American Steel & Wire Co.....Chicago.

SAFETY VALVES.

American Steam Gauge Co.....Boston.

Ashton Valve Co.....Boston.

Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.

Baker, Howard H. & Co.....Buffalo.

Upson-Walton Co.....Cleveland.

Wilson & Silsby.....Boston.

SALVAGE COMPANIES.

See wrecking companies.

SCHOOLS, CORRESPONDENCE—ENGINEERING AND NAVIGATION.

International Correspondence Schools.....Scranton, Pa.

SCREW MACHINES.

Niles Tool Works Co.....Hamilton, O.

SEARCH LIGHTS.

Elwell-Parker Electric Co.....Cleveland.

General Electric Co.....Schenectady, N. Y.

Rushmore Dynamo Works.....Jersey City, N. J.

Sprague Electric Co.....New York.

Westinghouse Electric & Mfg. Co.....Pittsburg, Pa.

SEPARATORS, (CENTRIFUGAL).

Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

SHAPERS.

American Tool Works Co. (The).....Cincinnati.

Niles Tool Works Co.....Hamilton, O.

SHEARS.

See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.

American Ship Building Co.....Cleveland.

Atlantic Works.....East Boston, Mass.

Bath Iron Works, Ltd.....Bath, Me.

Buffalo Dry Dock Co.....Buffalo.

Cramp, Wm. & Sons.....Philadelphia.

Craig Ship Building Co.....Toledo, O.

Chicago Ship Building Co.....Chicago.

Detroit Shipbuilding Co.....Detroit.

Fore River Engine Co.....Weymouth, Mass.

Hardy, John B.....Tacoma, Wash.

Harlan & Hollingsworth Co.....Wilmington, Del.

Iowa Iron Works.....Dubuque, Ia.

Jenks Ship Building Co.....Port Huron, Mich.

Maryland Steel Co.....Sparrow's Point, Md.

Moran Bros. Co.....Seattle, Wash.

Morse Iron Works & Dry Dock Co.....Brooklyn.

Neafie & Levy Ship & Eng. Bldg. Co.....Philadelphia.

Newport News Ship Bldg. Co.....Newport News, Va.

Nixon, Lewis.....Elizabeth, N. J.

Pusey & Jones Co.....Wilmington, Del.

Risdon Iron Works.....San Francisco.

Roach's Ship Yard.....Chester, Pa.

Townsend & Downey Ship Bldg. Co.....New York.

Trigg, Wm. R. Co.....Richmond, Va.

Union Dry Dock Co.....Buffalo.

Union Iron Works.....San Francisco.

Willard, Chas. P. & Co.....Chicago.

Wolff & Zwicker Iron Works.....Portland, Ore.

SHIP CHANDLERS.

Baker, Howard H. & Co.....Buffalo.

Marine Supply Co.....Fairport Harbor, O.

Moran, Bros. Co.....Seattle, Wash.

Upson-Walton Co.....Cleveland.

SPARS—LARGE SIZES.

Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.

Holmes, Samuel.....New York.

STEEL OR IRON STAYBOLTS, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line.....New York.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL SHAFTS, SOLID OR HOLLOW.

Bethlehem Steel Co.....So. Bethlehem, Pa.

STEERING APPARATUS.

American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.

Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.

Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.

American Bridge Co.....New York.

SURVEYORS, MARINE.

Curr, Robert.....Cleveland.
Gibbs & Joys.....Milwaukee.

TELEGRAPH—DECK AND ENGINE ROOM.

Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.

Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

THERMOMETERS FOR MECHANICAL PURPOSES.

Helios-Upton Co.....Peabody, Mass.

TIMBER—LARGE PIECES.

Moran Bros. Co.....Seattle, Wash.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Chicago Pneumatic Tool Co.....Chicago.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mfg. Co.....Janesville, Wis.

Niles Tool Works Co.....Hamilton, O.
Pelton Engineering Co.....Cleveland.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.
Wood & Co., R. D.....Philadelphia.

TOOLS, WOOD WORKING.

Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

TRUCKS.

Boston & Lockport Block Co.....Boston, Mass.

TOWING MACHINES.

American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.
Playfair's Barge & Tug Line.....Midland, Ont.

TOWING COMPANIES.

Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Swain Wrecking Co.....Detroit.

TUBING FOR BOILERS.

Atlantic Tube Co.....Pittsburg.
Shelby Steel Tube Co.....Cleveland.

TUBES, SEAMLESS DRAWN, BRASS AND COPPER.

Hungerford Brass & Copper Co., U. T.....New York.

VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gauge & Valve Co.....Boston.
Jenkins Bros.....New York.

VARNISH MAKERS, COLOR GRINDERS, ETC.

Smith, Edward & Co.....New York.

VARNISH PAINT.

Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.

Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Bull & Co., A. H.....New York.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Mitchell & Co.....Cleveland.

Moffat & O'Brien.....San Francisco.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.

VENTILATING APPARATUS FOR SHIPS.

Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant Co., B. F.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.

American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebbing's Sons, John A.....New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gauge & Valve Co.....Boston.
Signal & Control Co.....New York.

WINDLASSES.

American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.

Fay & Egan Co., J. A.....Cincinnati, O.
Woods Machine Co., S. A.....So. Boston.

WORM GEARING.

Morse, Williams & Co.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.

Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Playfair's Barge & Tug Line.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.

Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.

Dreln, Thos. & Son.....Wilmington, Del.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.
Willard, Chas. P. & Co.....Chicago.

YAWLS.

Dreln, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

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ECONOMY 6 1/2% SAVING IN FUEL

MARCH 5, 1900
200,000 IN USE

EFFICIENCY 99% LABORATORY TEST

MAY 21, 1896 100,000	MAY 1, 1898 141,967	MAY 1, 1899 167,912	MAY 1, 1897 119,009
JUNE 1, 1892 42,118	JUNE 1, 1894 63,876	JUNE 1, 1895 81,217	JUNE 1, 1893 53,967
JUNE 1, 1890 20,625	JUNE 1, 1891 30,761	JUNE 1, 1889 11,478	JUNE 1, 1887 2503 IN USE
JUNE 1, 1888 6124			

MERIT

SIMPLICITY

RELIABILITY

PENBERTHY

ECONOMY

EFFICIENCY

DURABILITY

LARGEST INJECTOR MANUFACTURERS IN THE WORLD

PENBERTHY

STARTING UPON A SOLID FOUNDATION, WE HAVE BUILT UP OUR BUSINESS, STONE BY STONE, INCREASING OUR ANNUAL SALES OF INJECTORS FROM 2500 IN OUR FIRST YEAR TO MORE THAN 30,000 IN OUR FOURTEENTH YEAR. THE GENUINE PENBERTHY GIVES SATISFACTION.

PENBERTHY INJECTOR CO., DETROIT, MICH., U.S.A.
BRANCH OFFICE, WINDSOR, CANADA

LAKE SHORE & MICHIGAN SOUTHERN RAILWAY.

CLEVELAND CITY TICKET OFFICE,
237 SUPERIOR STREET.

Eastward:—		Ar. fr. West.	Dep. East.
No. 18, Southwestern Limited.....			*1 55 am
No. 22, Lake Shore Limited.....		*2 15 am	*2 20 am
No. 28, New York & Boston Express		*7 40 am	*8 00 am
No. 32, Fast Mail		*11 25 am	*11 30 am
No. 44, Accommodation, via Sandusky		†1 15 pm	
No. 46, Southwestern Express.....			*3 00 pm
No. 6, Limited Fast Mail		*5 40 pm	*5 45 pm
No. 10, Chicago, New York & Boston Special...		*7 35 pm	*7 40 pm
No. 16, New England Express.....		*10 30 pm	*10 35 pm
No. 2, Day Express		†9 05 pm	†9 20 pm
No. 126, Norwalk Accommodation		†7 55 am	
No. 40, Toledo & Buffalo Accom., via Norwalk.		†10 00 am	†10 30 am
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Westward:—		Ar. fr. East.	Dep. West.
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No. 21, New York & Chicago Express		*5 10 am	*5 20 am
No. 7, Day Express			*6 30 am
No. 19, The Lake Shore Limited		*7 35 am	*7 40 am
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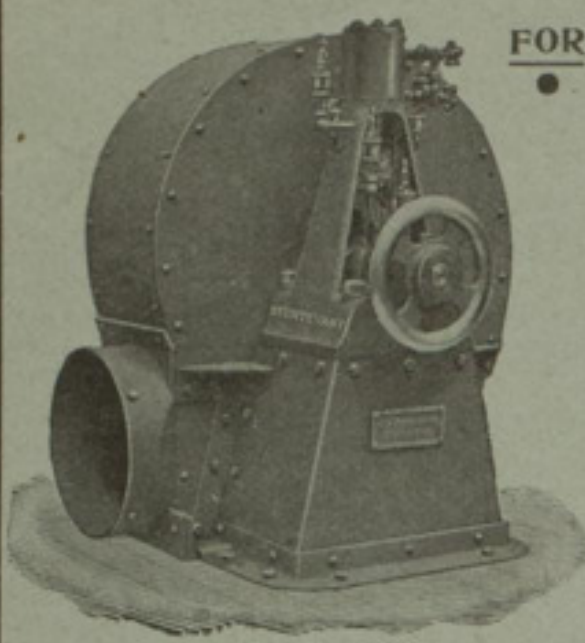
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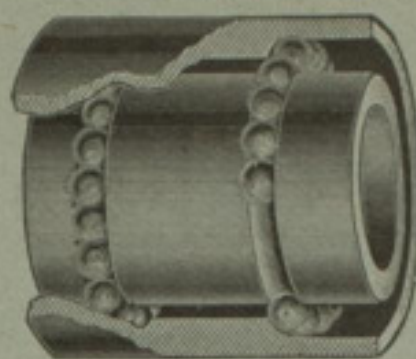
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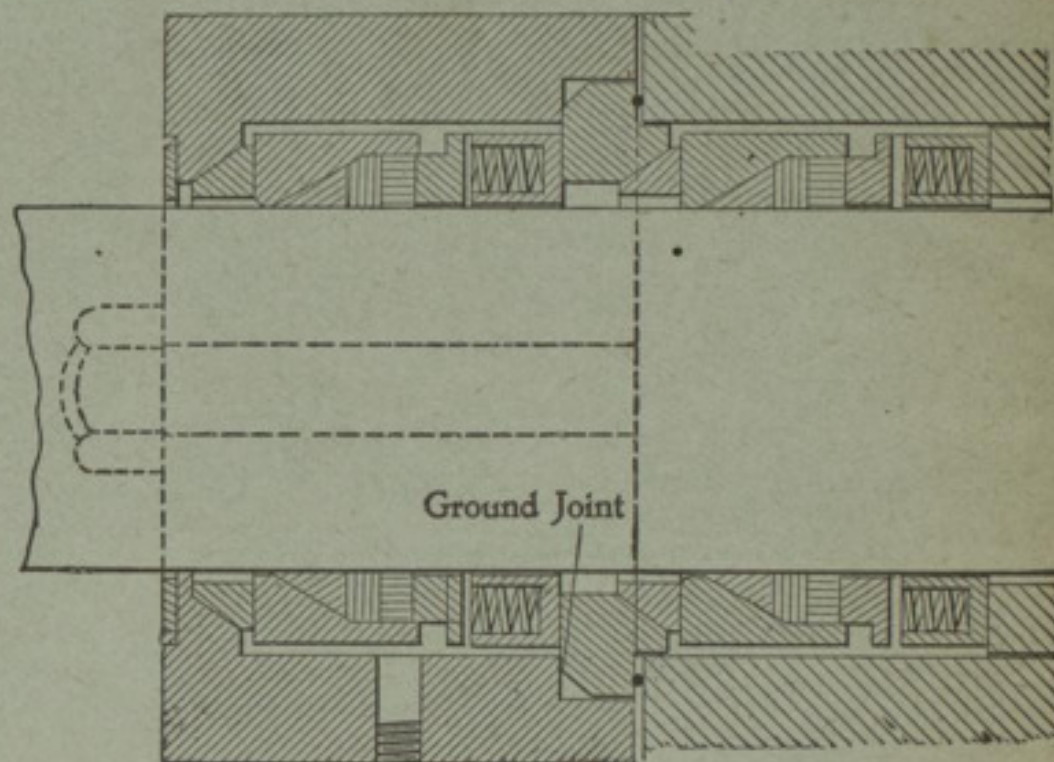
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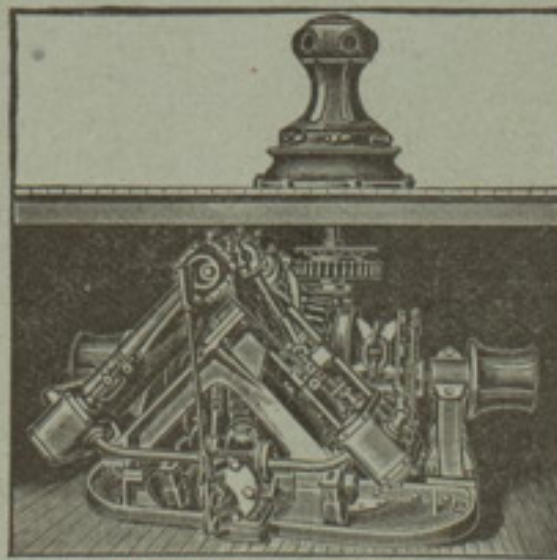
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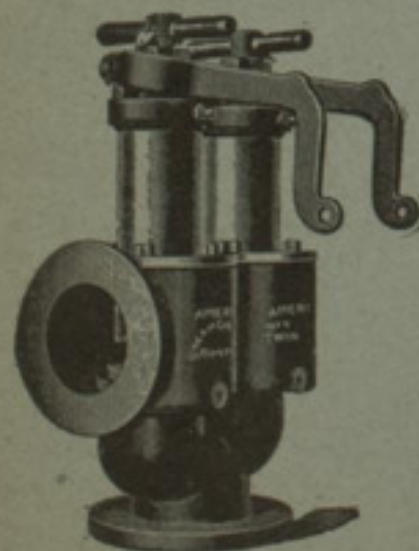
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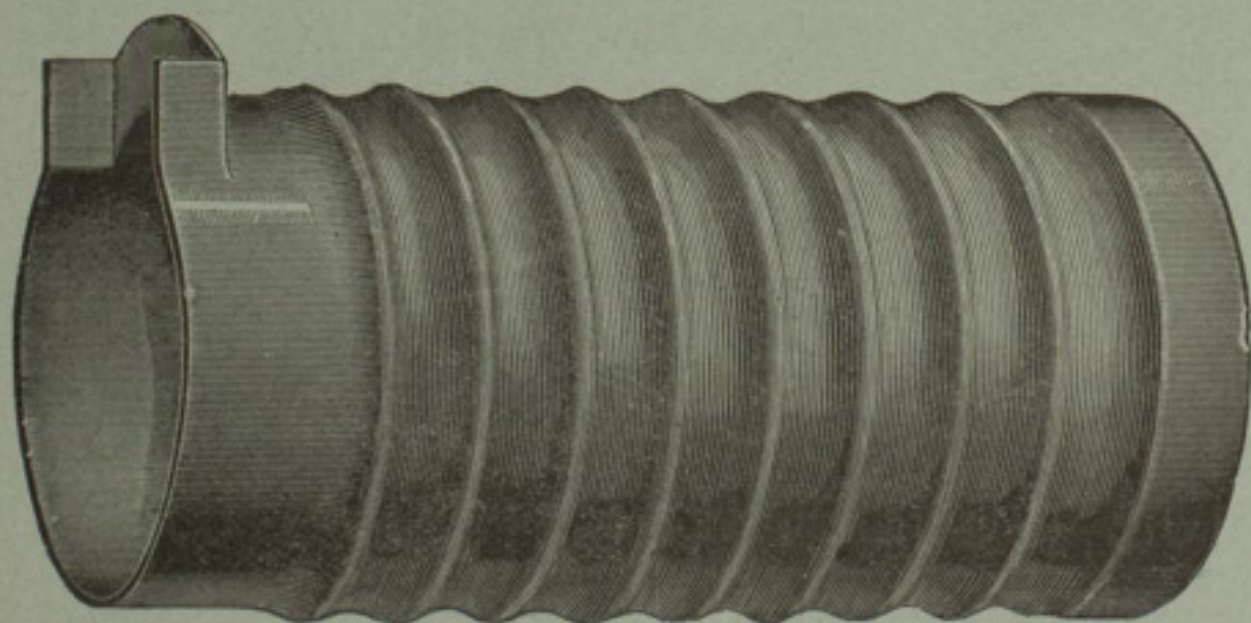
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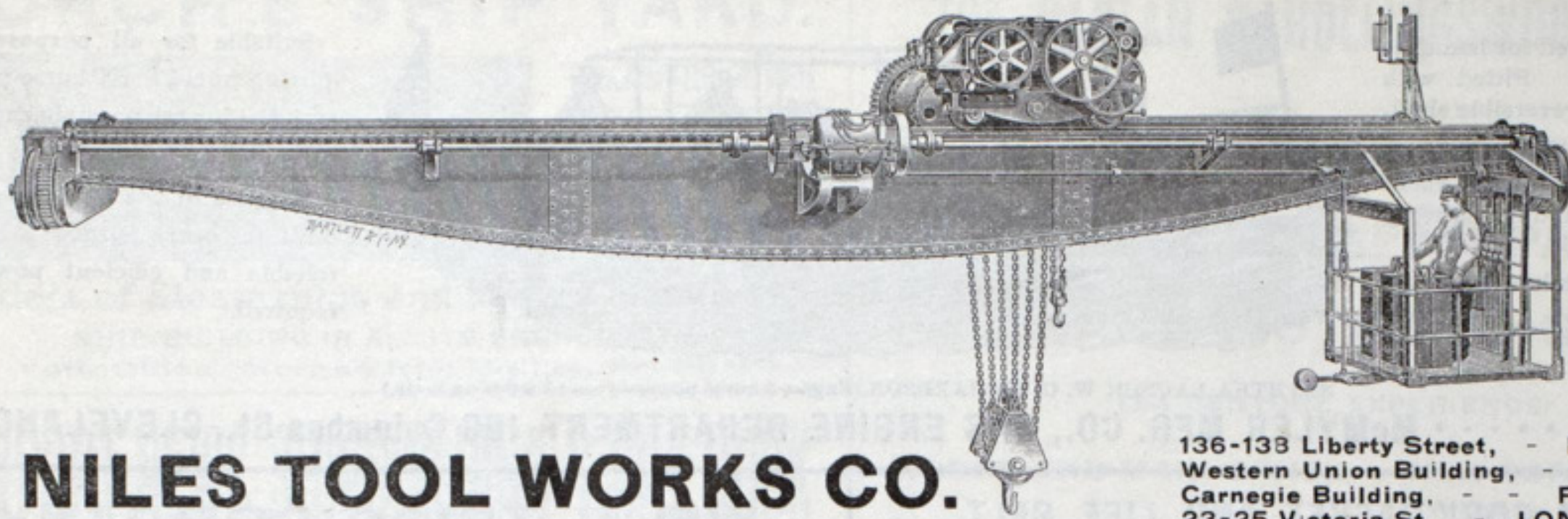
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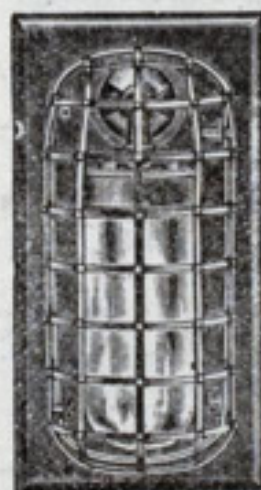
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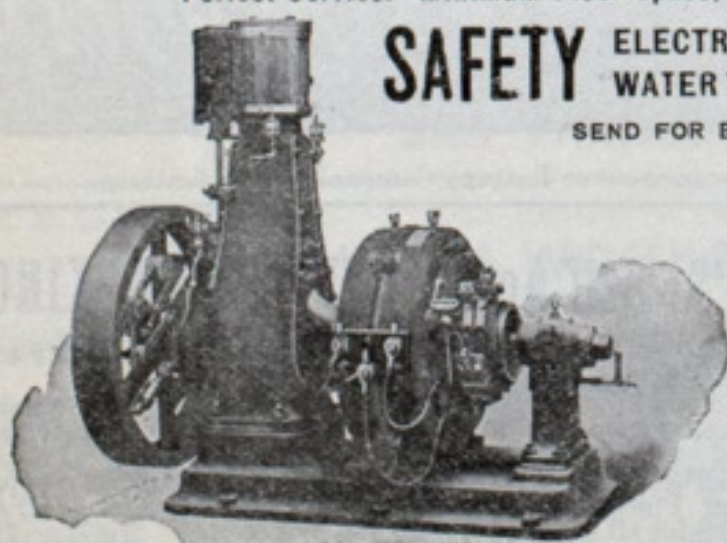
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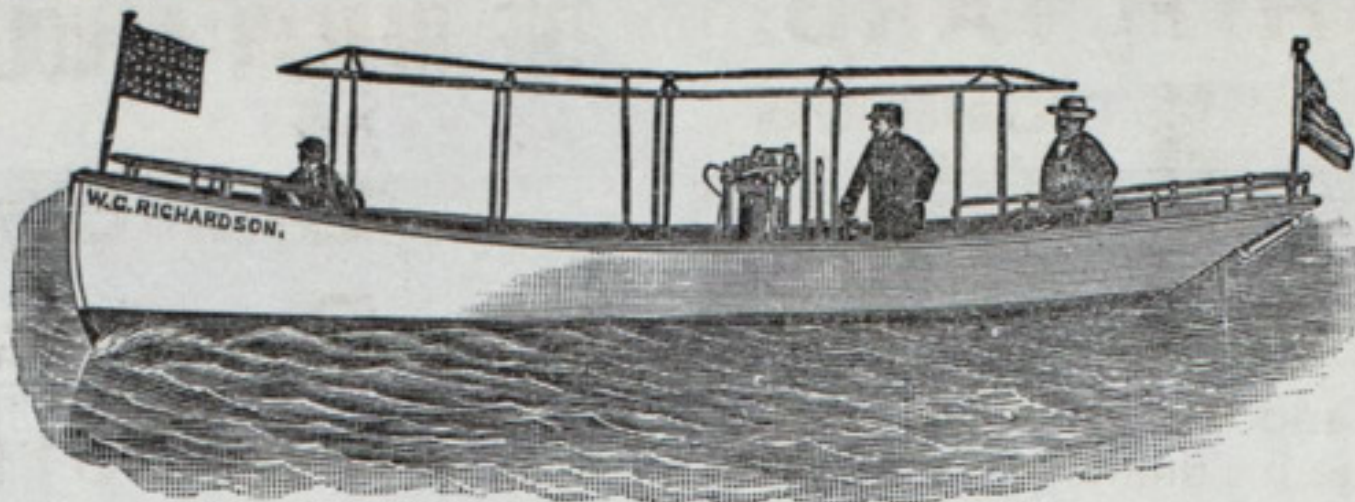
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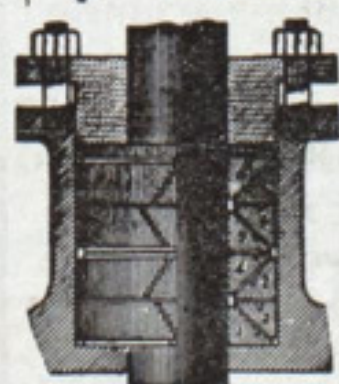
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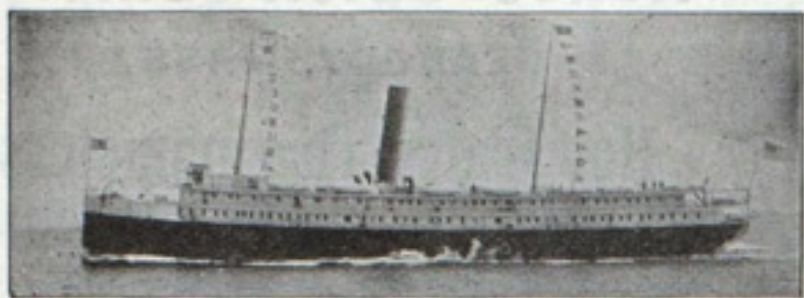
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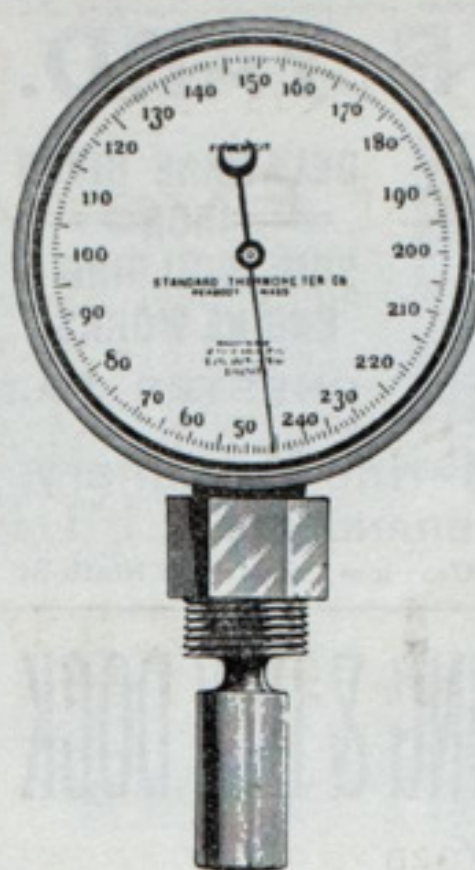
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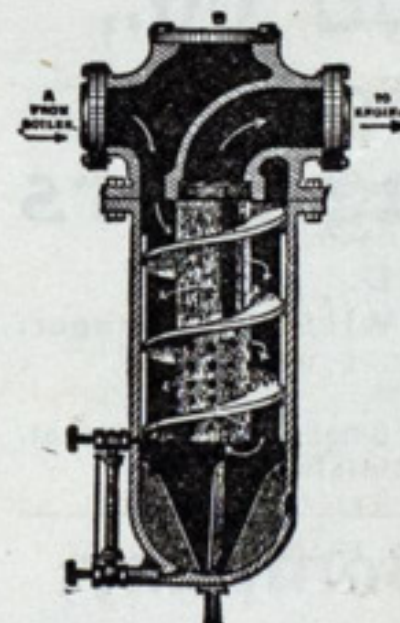
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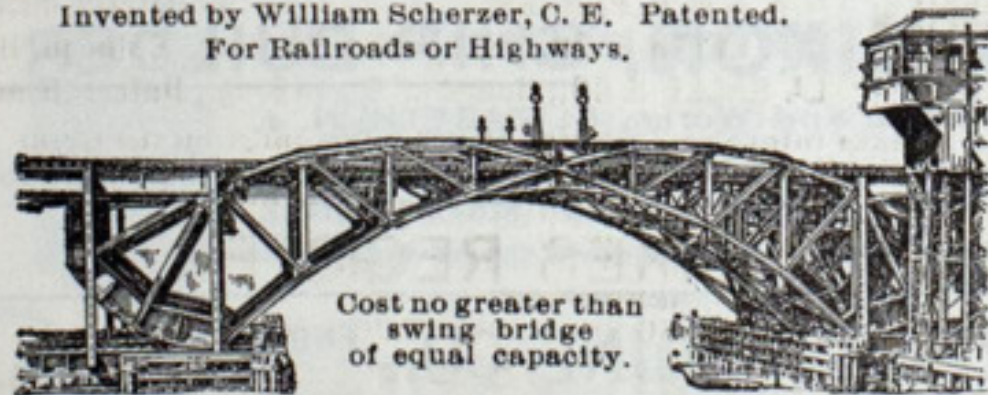
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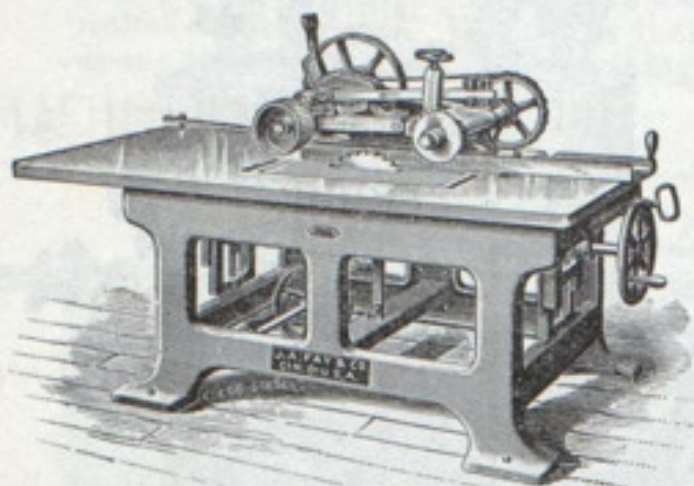
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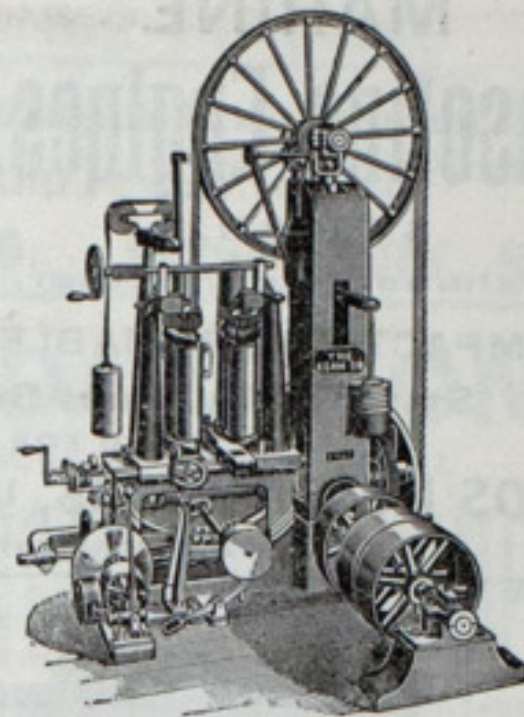
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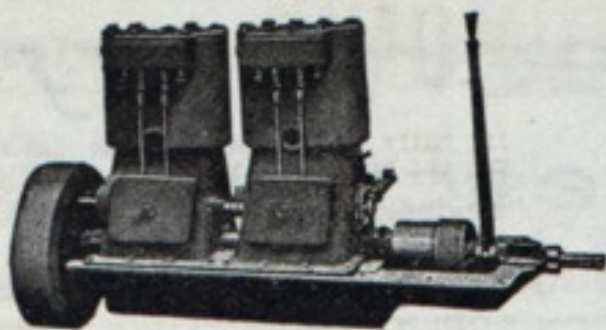
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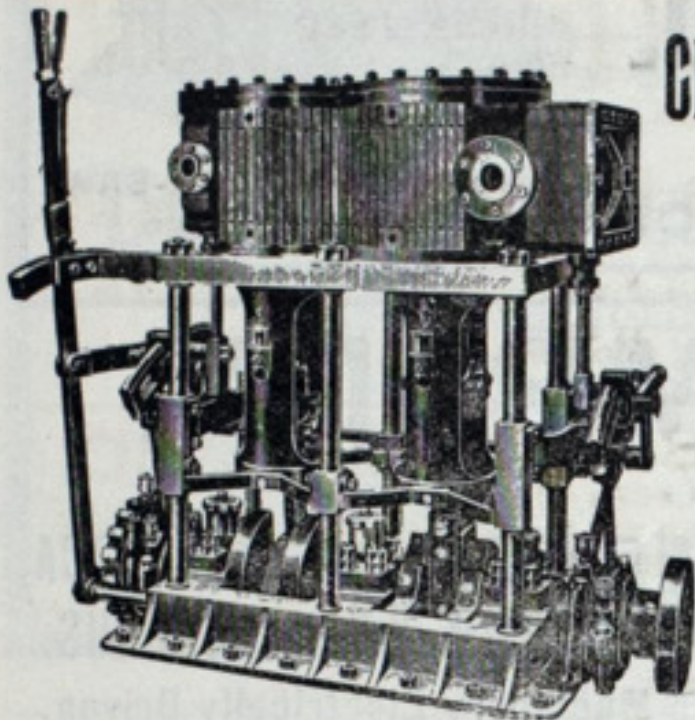
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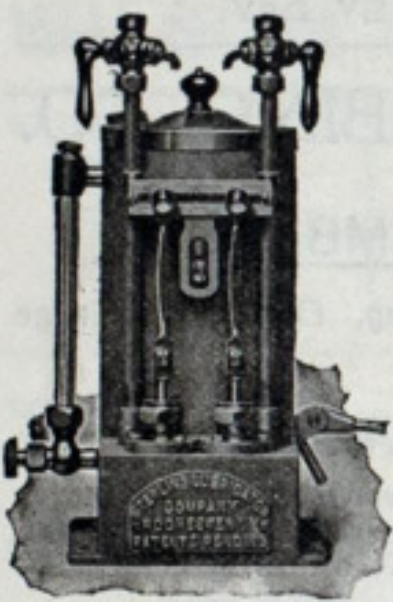
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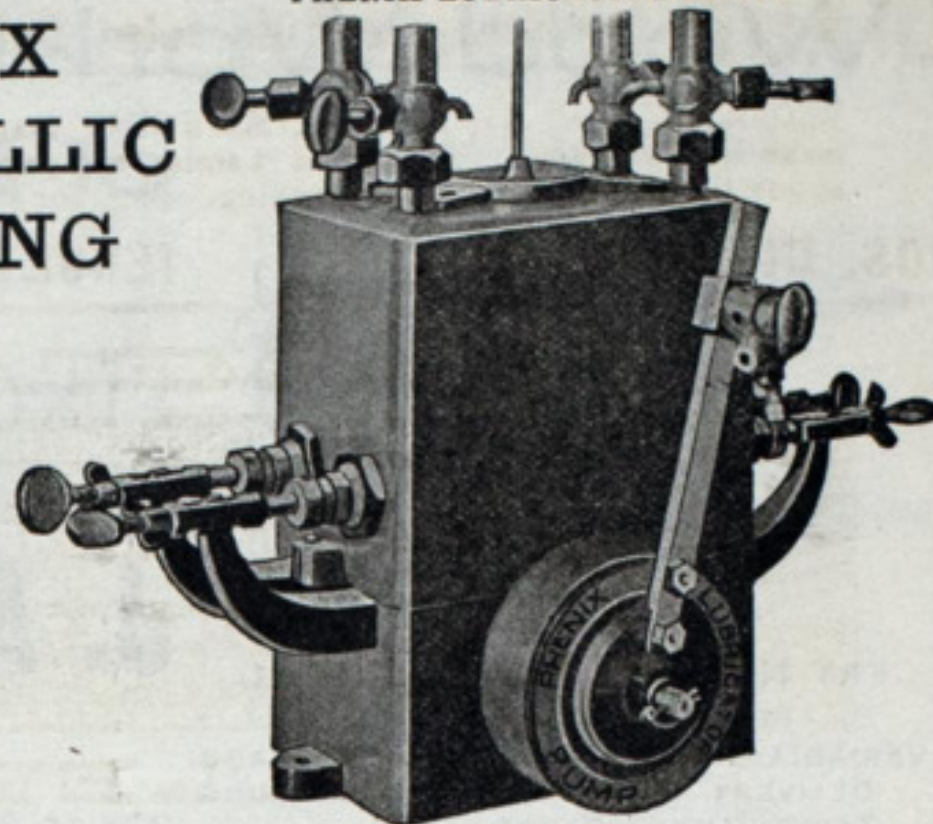
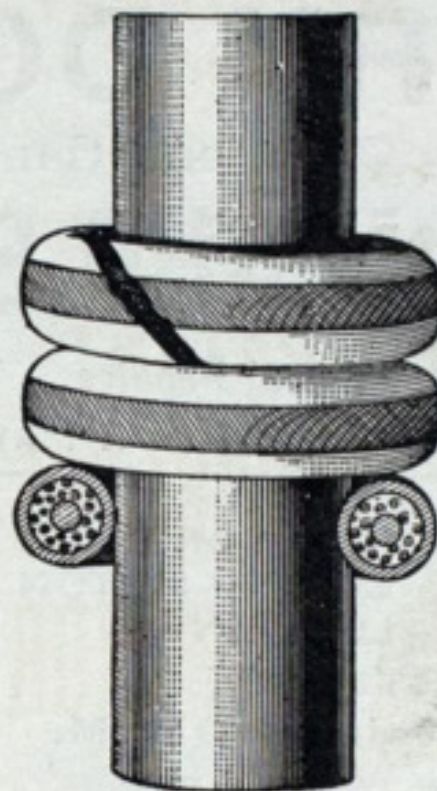
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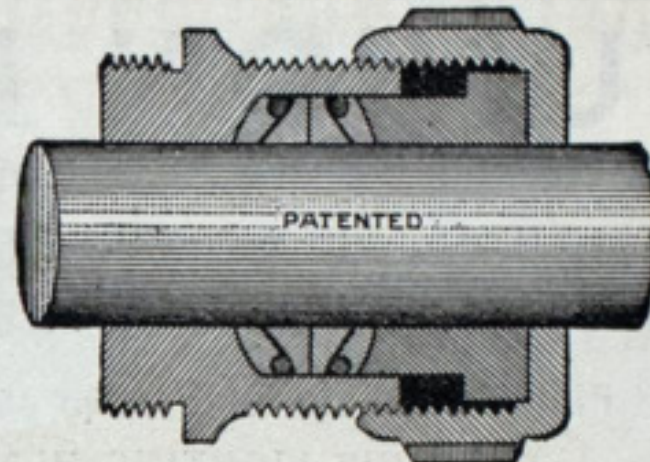
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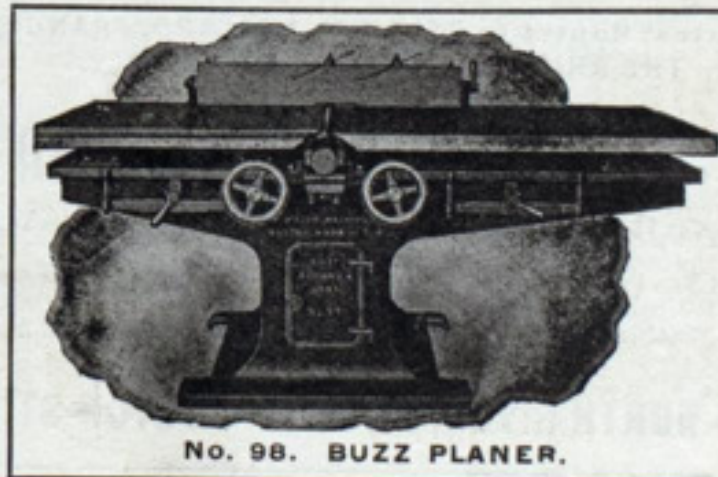


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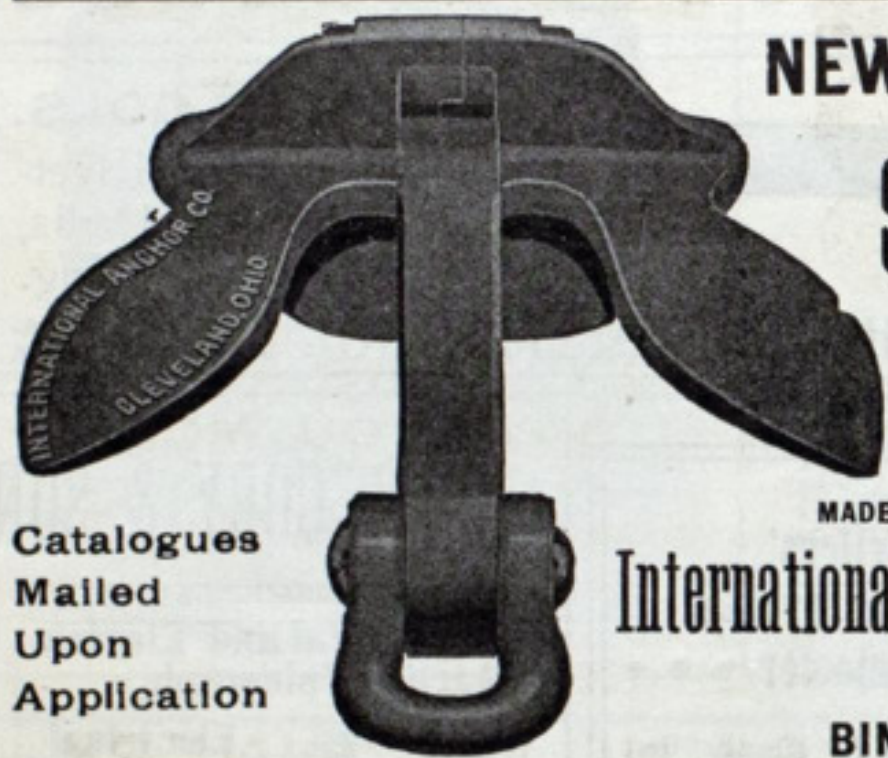
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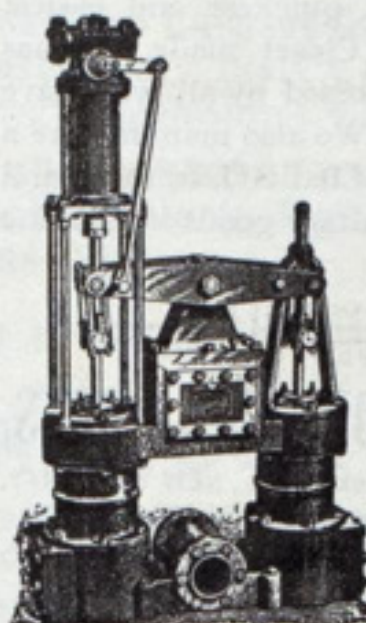
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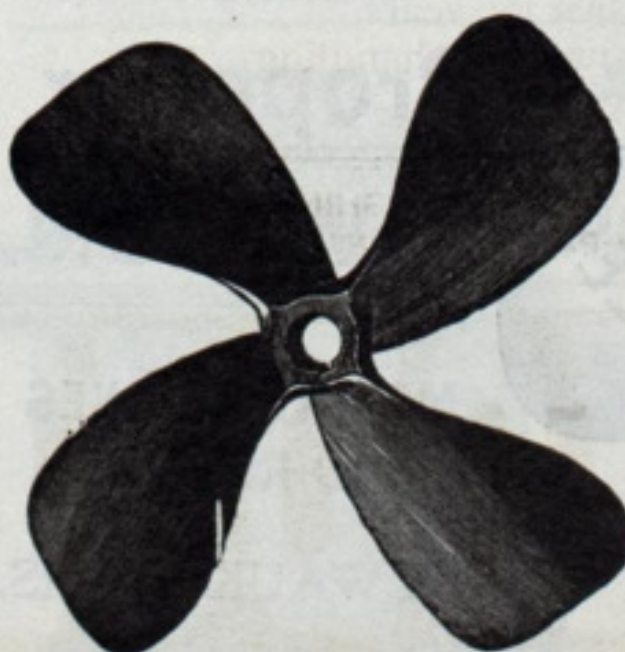
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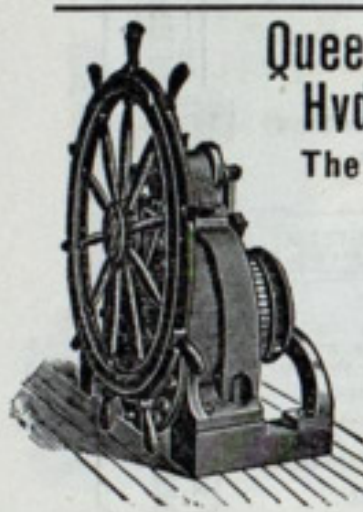
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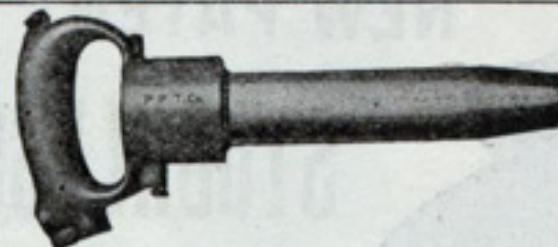
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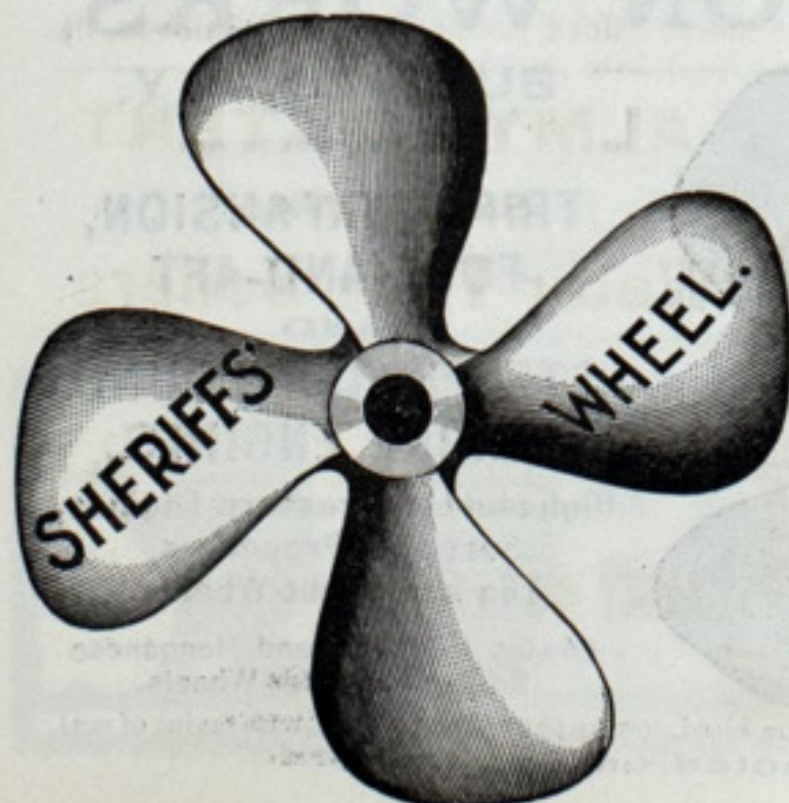
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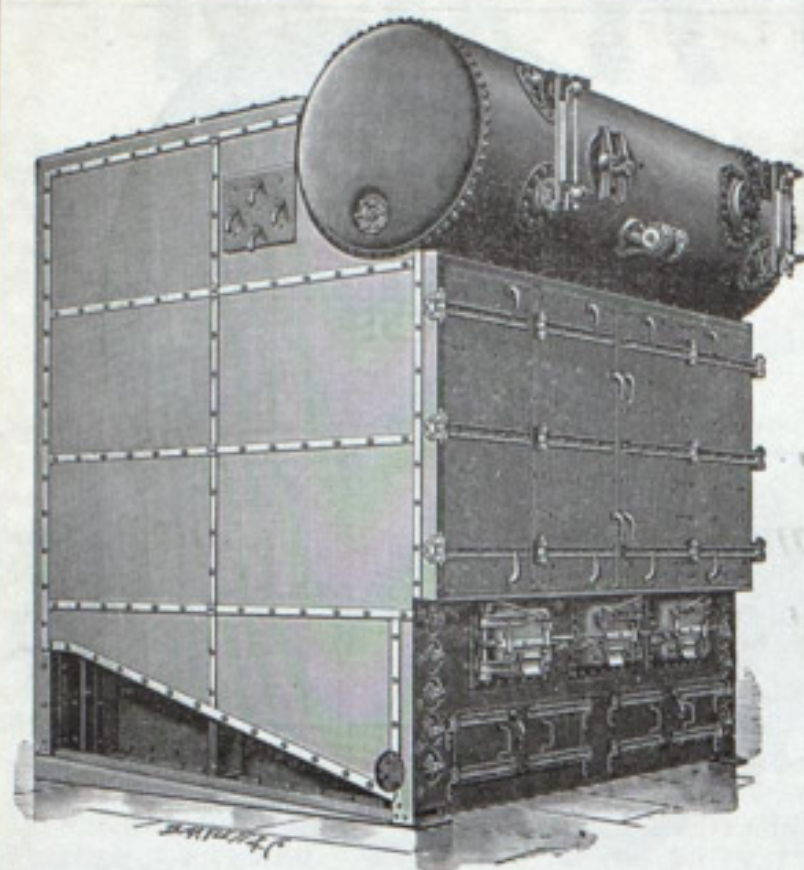
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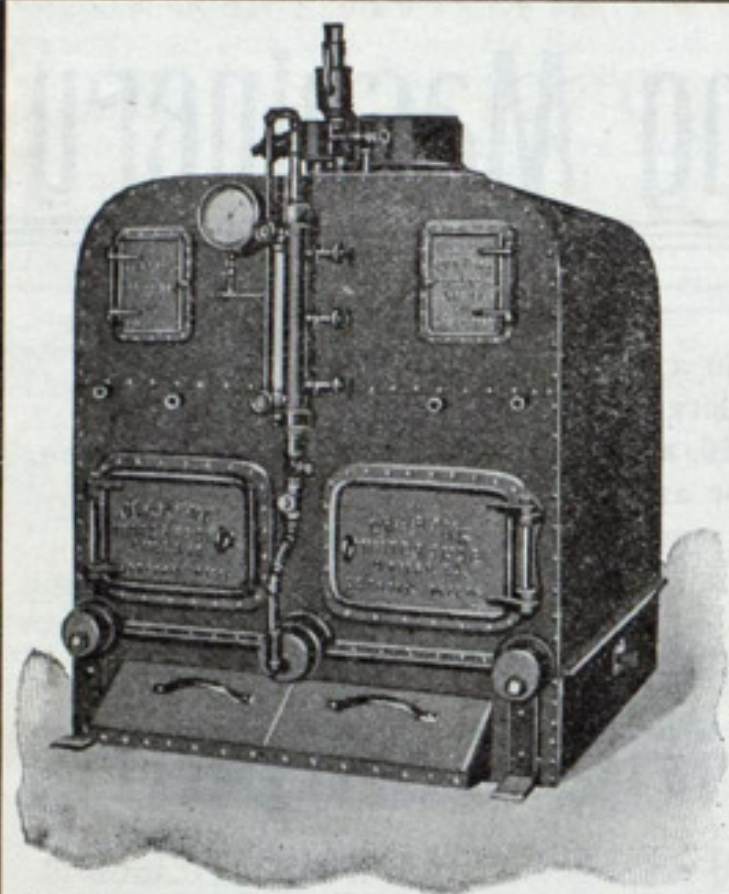
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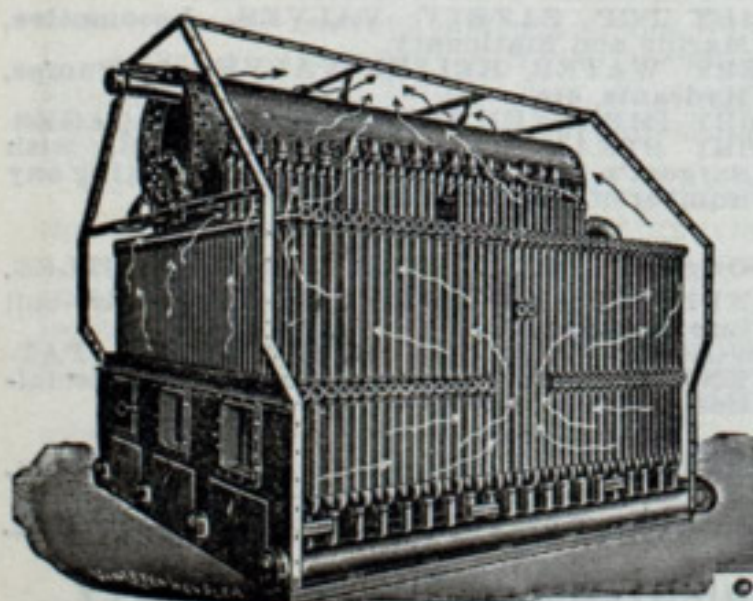
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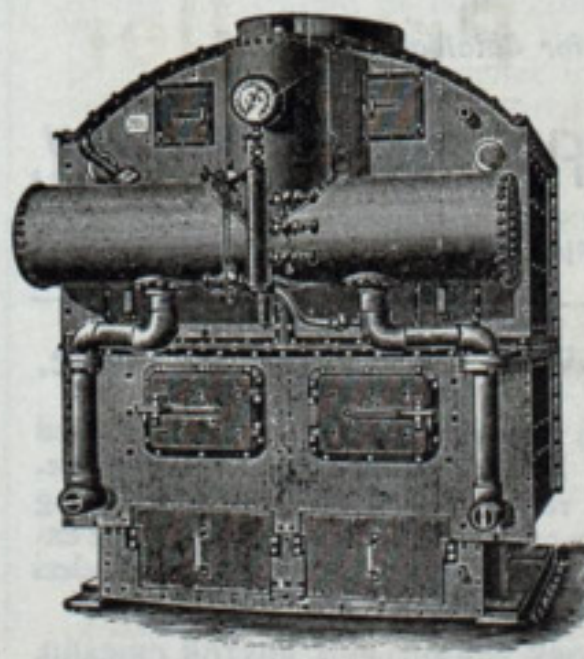
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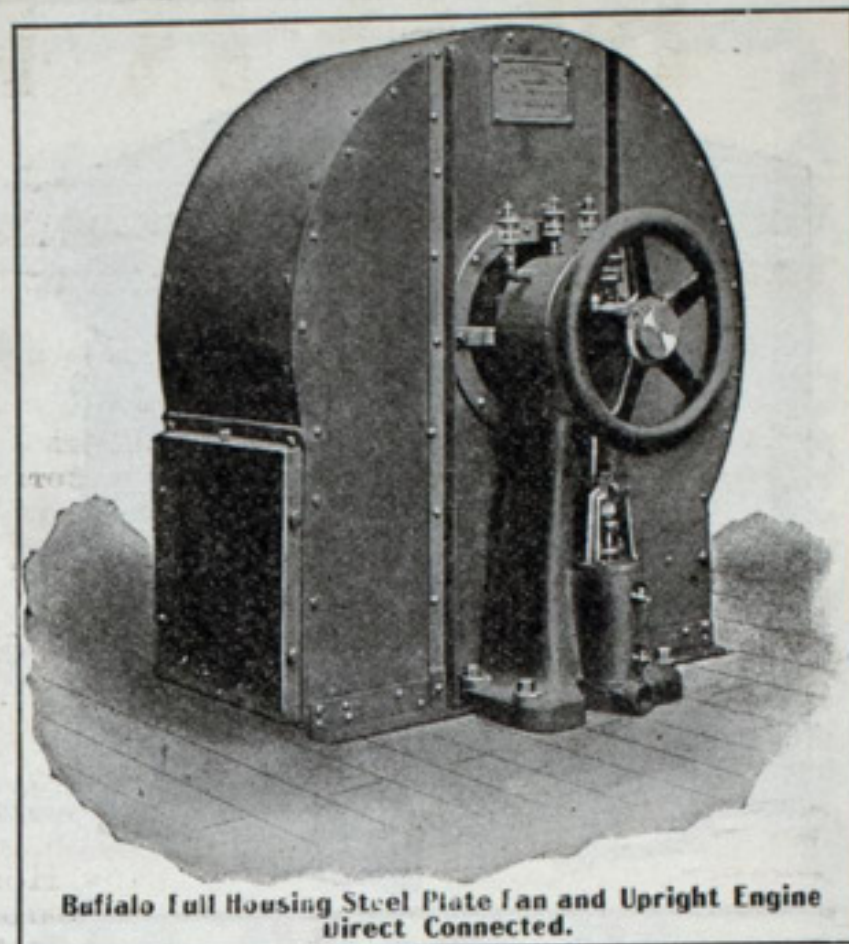
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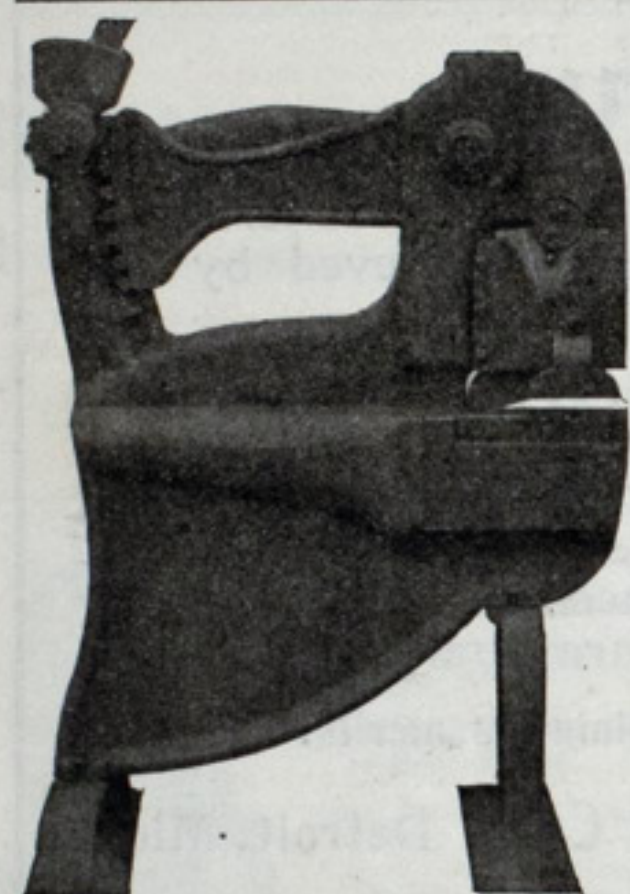
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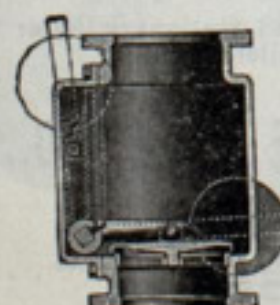
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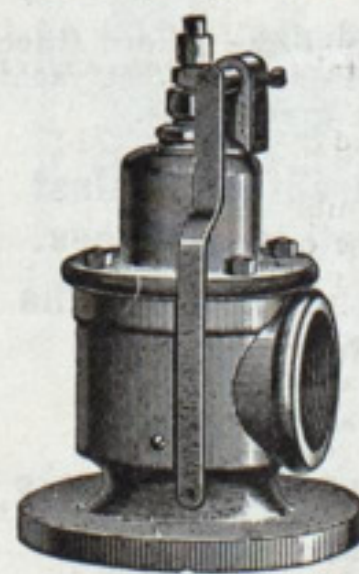
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